ADVERTISEMENT.

The completion of a Fourth Annual Volume of Novelties in Science and Art presents but little occasion for our again commending its design to the public. It is, however, a source of satisfaction in proving the usefulness, not to say importance, of the work to be very extensively appreciated, since the success of its predecessors has naturally enough led to the production of the present volume. To this declaration we are enabled to add the testimonials of the most accredited Literary Journals of the day.

Of the Contents of the present volume we have space but to say a few words, by way of summary :—

	Articles
The First Division contains nearly 100 pages of Inventions, Improvements, and New Facts connected with all branches of the Mechanic Arts, and comprises - - - - - - - - -	90
The Second consists of 50 pages of New Facts in various departments of Chemical Science - - - - - - - - - - - - -	60
The Third enumerates nearly 90 pages of Facts and Phenomena in almost every branch of Natural History and Naturo-Philosophical Knowledge, or - - - - - - - - - - - - - -	100
A Subdivision of this head includes 15 pages of Astronomical and Meteorological Phenomena, or - - - - - - - - -	20
The Fourth Division consists of 12 pages of Practical Information in Agriculture, and Rural Economy in general, or - - -	24
The Fifth contains 14 pages of New Facts and Instructions in every department of Horticulture, or - - - - - - - -	40
The Sixth consists of 12 pages of Improved Receipts in Domestic Management, or - - - - - - - - - - - - -	40
The Seventh includes about 6 pages connected with the Useful and Fine Arts, or - - - - - - - - - - - - - - -	13
Total Number of Articles - - - - -	387

It will thus be seen there are nearly 400 NEW ABSTRACTS in the present volume. We say "new" because they are the accumulation of the last twelve or fifteen months. To these are added a List of Patents granted within the past year, and memoranda of the most striking efforts for the extension of civilization in what are generally termed Expeditions of Discovery.

The annual cost of the Journals from which these articles or abridgments have been prepared exceeds Twelve Guineas; so that if these Facts be the most important in such Journals, the economy of their production in a Five Shilling volume requires no further illustration. Any person accustomed to turn over the Transactions of Public Societies, or other voluminous works devoted exclusively to Science, will readily acknowledge the saving of time which the preparation of an assemblage of Abstracts, like the present, must effect; and time, we know, is the stuff of which life is made.

With this impression of the general advantages of the plan of the following pages, we again thank the purchasers of our previous volumes, and hope the new and striking contents of the present may ensure us an increase of "annual" friends.

London, March 23, 1831.

CONTENTS.

ENGRAVINGS.

ARCANA OF SCIENCE,

&c. &c.

Mechanical and Useful Inventions.

LIVERPOOL AND MANCHESTER RAILWAY.

(See the Frontispiece.)

THE commencement of our volume for 1830 was occupied by the details of the GRAND RACE for 500*l.*; and these particulars sufficiently illustrate the principles upon which this splendid work has been completed.*

Our present object is, therefore, to furnish the reader with a popular or rather pictorial survey of the Railway; for which purpose we avail ourselves of an official "Account," published by Mr. Henry Booth, Treasurer to the Company;† to which source also we are indebted for the original of the Frontispiece.

To accomplish a complete survey of the Railway, we should commence our journey of observation at the Liverpool end, in the Company's yard, in Wapping. Here the lower entrance of the great Tunnel is accessible through an open cutting, 22 feet deep and 46 feet wide, being space for four lines of Railway, with pillars between the lines to support the beams and flooring of the Company's warehouses, which are thrown across this excavation, and under which the wagons pass to be loaded or discharged through hatchways or trap doors communicating with the stores above; wagons loaded with coal or lime passing underneath the warehouses to the open wharfs at the Wapping end of the station.

Proceeding along the Tunnel, the line of Railway curves to the right, or south-east, till it reaches the bottom of the inclined plane, which is a perfectly straight line, 1,980 yards in length, with a uniform rise of three-quarters of an inch to a yard. The Railway from Wapping to the commencement of the inclined plane is level; the whole rise, therefore,

* In the *Companion to the Almanac* for 1830, the reader will find a valuable communication on the state of the works up to November, 1829, from Mr. George Stephenson, the engineer.

† An account of the Liverpool and Manchester Railway, &c. Second Edition, with a Postscript, dated Jan. 20, 1831.

from Wapping to the Tunnel mouth, at Edgehill, is 123 feet. The Tunnel is 22 feet wide and 16 feet high, the sides being perpendicular for five feet in height, surmounted by a semicircular arch of 11 feet radius: the total length is 2,250 yards. It is cut through various strata of red rock, blue shale and clay, but principally through rock of every degree of hardness, from the softest sand-stone to the most compact free-stone, which the axe or the chisel will with difficulty penetrate. It frequently was found necessary, in the progress of the work, to make an artificial vault of masonry, which has been effected by brick arch-work in those places where the natural rock could not be trusted to support the superincumbent mass. The height from the roof of the Tunnel upwards to the open surface of the ground, varies from five feet to 70, the greatest mass of superstratum being in the vicinity of Hope-street and Crabtree-lane. The whole length of this vast cavern is now furnished with gas-lights, and the sides and roof are whitewashed, to give better effect to the illumination.

At the upper or eastern end of the Tunnel, the traveller emerges into a spacious and noble area, 40 feet below the surface of the ground, cut out of the solid rock, and surmounted on every side by walls and battlements. From this area there returns a small Tunnel, 290 yards in length, 15 feet wide, and 12 feet high, parallel with the large one, but inclining upwards in the opposite direction, and terminating in the Company's premises in Crown-street, at the upper and eastern boundary of Liverpool; being the principal station for the Railway coaches, and the depot for coals for the supply of the higher districts of the town.

Proceeding eastward from the two Tunnels, the road passes through a Moorish archway which is to connect the two engine-houses, and will form the grand entrance to the Liverpool stations. This structure is from a spirited design of Mr. Foster's, (*See the Frontispiece.*) The traveller now finds himself on the open road to Manchester, and has an opportunity of contemplating the peculiar features of a well-constructed Railway, the line in this place being perfectly level; the slight curve, which was unavoidable, beautifully set out; the road-way clean, dry, and free from obstructions; and the rails firmly fixed on massive blocks of stone. Crossing Wavertree-lane, the Railway descends for 5½ miles at the rate of four feet in the mile,—a declivity so slight and uniform as not to be perceived by the eye, but still sufficient to give a mechanical advantage and facility of motion to a load passing in that direction. The road a little beyond Wavertree-lane is carried through a deep marle cutting, under several massive stone archways, thrown across the excavation to form the requisite communications between the roads and farms on the opposite sides of the Railway. Beyond the marle cutting is the great rock excavation through Olive Mount, about half a mile to the north of the village of Wavertree. Here the traveller passes through a deep and narrow ravine, 70 feet below the surface of the ground, little more space being opened out than sufficient for two trains of carriages to pass each other.

Emerging from the Olive Mount cutting, you approach the great Roby embankment, formed of the materials dug out of the excavation we have described. This embankment stretches across the valley for about two miles, varying in height from 15 to 45 feet, and in breadth at the base from 60 to 135 feet. Here the traveller finds himself affected by sensations the very reverse of what he felt a few minutes before. Mounted above the tops of the trees, he looks around him over a wide expanse of

country, in the full enjoyment of the fresh breeze, from whatever quarter it may blow.

After passing the Roby embankment you cross the Huyton turnpike road, leaving Huyton Church and village on the left hand, and proceed in a slightly curved direction to the bottom of the inclined plane at Whiston, between seven and eight miles from the Company's station in Liverpool. This plane rises in the ratio of three-eighths of an inch in a yard, (or 1 in 96.) It is a mile and a half long in one straight line, and the inclination (being so slight) would scarcely attract observation, did not a decrease in the speed of the carriages indicate that an important change had taken place in the level of the way. At the top of the Whiston inclined plane there is a portion of the road (nearly two miles in length) on the exact level. About half a mile from the top of the inclined plane, the turnpike road from Liverpool to Manchester crosses the line of the Railway at an acute angle of 34 deg., and is carried over the Railway by a substantial stone bridge, of very curious and beautiful construction, being built on the diagonal or skew principle, each stone being cut to a particular angle to fit into a particular place, the span of the arch, measured at the face, being 54 feet, while the width of the Railway underneath, measured from wall to wall, is only 30 feet,—each face of the arch extending diagonally 45 feet beyond the square. Rainhill bridge is nine miles from the Company's yard in Wapping, and it was underneath and on each side of this bridge that the experiments took place with the Locomotive Engines which contended for the premium of 500*l*. in October, 1829.

Passing over the summit level at Rainhill, we come to the Sutton inclined plane, which descends in the opposite direction, and is similar in extent and inclination to the Whiston plane, the top level being 82 feet above the base of each plane. Parr Moss is the next object of attention, the road-way across the principal part of it being formed by the deposit of heavy material (clay and stone) dug out of the Sutton inclined plane. This Moss is about 20 feet deep, and the material forming the Railway, as it was deposited, sank to the bottom, and now forms an embankment in reality 25 feet high, though only four or five feet appears above the surface of the Moss.

Leaving Parr Moss, we soon approach the great valley of the Sankey (about half way between Liverpool and Manchester,) with its Canal at the bottom, and its flats or barges in full sail passing to and fro, between the River Mersey, near Warrington, and the great Coal districts near St. Helen's. Over this valley and Canal, and over the topmasts and high peaks of the barges, the Railway is carried along a magnificent viaduct of nine arches, each 50 feet span, built principally of brick, with stone facings, the height from the top of the parapets to the water in the Canal being 70 feet, and the width of the Railway between the parapets 25 feet.

On leaving the Sankey, we speedily approach the town of Newton. A few hundred yards to the south of the town, the Railway crosses a narrow valley by a short but lofty embankment, and a handsome bridge of four arches, each 40 feet span.

A few miles beyond Newton is the great Kenyon excavation from which about 800,000 cubic yards of clay and sand have been dug out, part being carried to form the line of embankment to the east and west of the cutting; and the remainder deposited as spoil banks, may be seen heaped up, like Pelion upon Ossa, towering over the adjacent land.

Near the end of this cutting, the Kenyon and Leigh Junction Railway joins the Liverpool and Manchester line by two branches, pointing to the two towns respectively. This Railway joins the Bolton and Leigh line, and thus forms the connecting link between Bolton, Liverpool, and Manchester. From the Kenyon excavation the transition is easy to the Brosely embankment, formed of the material dug out of the cutting, as before described. Moving onward, we pass over Bury-lane and the small River Gless, or Glazebrook, being arrived on the borders of the far-famed Chat Moss. This barren waste comprises an area of about twelve square miles, varying in depth from 10 to 35 feet, the whole mass being of so spongy and soft a texture that cattle cannot walk over it.

Beyond Chat Moss we traverse the Barton embankment, crossing the low lands for about a mile between the Moss and the Worsley Canal over which the Railway is carried by a neat stone bridge. At this spot it is evident you are approaching a manufacturing district.

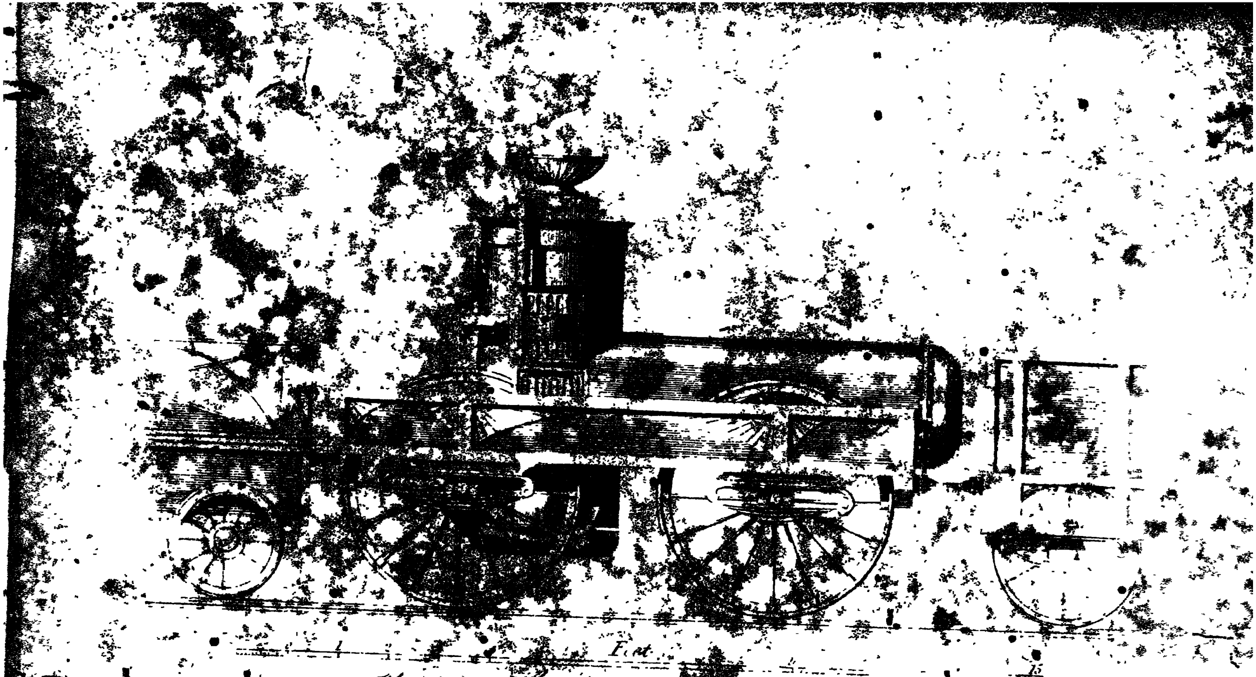
From the Barton embankment we soon arrive at Eccles, four miles from Manchester, leaving to the right the vicarage and parish church of that village. Between this place and Manchester the Railway passes at no great distance from several country seats and villas, whose rich lawns and flourishing plantations afford an agreeable variety, after the great sand hills at Kenyon, or the wide waste of Chat Moss.

The immediate approach to Manchester, by the Railway, is through a portion of Salford, as little interesting as can well be imagined. Over the River Irwell the Railway is carried by a very handsome stone bridge, and then over a series of arches, into the Company's station in Water-street and Liverpool-road, Manchester.

We may sum up with the following from the *Companion to the Almanac* for the present year:

On the line between Liverpool and Manchester there are, besides culverts and foot-bridges, 63 bridges, of which thirty pass under the turnpike-road, twenty-eight over it, four over brooks, &c. and one over the river Irwell. There are twenty-two of brick, seventeen of wood and brick, eleven of brick and stone, eleven of wood, and two of stone and wood. On the surface of the ground above the mouths of the tunnels are built two lofty chimneys in the form of columns, with handsome capitals; they are upwards of 100 feet in height, unique specimens of brickwork, and have an elegant appearance.

From the top of the Liverpool tunnel to Manchester, with the exception of two inclined planes at Rainhill (one ascending and the other descending, at an inclination of 1 in 96, and where some assistant power must be used), there is no greater inclination than in the ratio of about 1 in 880; and since the advantage on the descending side will nearly counterbalance the disadvantage in ascending so gradual a slope, the railway may be regarded, for practical purposes, as nearly horizontal. The rails at the mouth of the tunnel, at Edge-hill, are 46 feet above the rails at the Manchester end of the line. Along the line there are, at every mile and quarter of a mile, posts showing the distance from Liverpool to Manchester. The rails used on the road are made of forged iron, in lengths of five yards each, and weigh 35 pounds per yard. Every three feet the rails rest on blocks of stone, let into the ground, containing each nearly four cubic feet. Into each block two holes, six inches deep and one inch in diameter, are drilled; into these are driven oak plugs, and the cast iron chairs or pedestals into which the rails are immediately fitted



William the Fourth Locomotive Engine

are firmly spiked down to the plugs, forming a structure of great solidity and strength. On the embankments, where the road may be expected to subside a little, the rails are laid on oak sleepers. For eighteen miles of the road the rails are placed on stone blocks, and for the other thirteen on sleepers. The double line of rails for the carriages are laid down with mathematical correctness, and consist of four equi-distant rails, four feet eight inches apart, about two inches in breadth, and rising about an inch above the surface.

In the formation of the railway there have been dug out of the different excavations upwards of three millions of cubic yards of stone, clay, and soil. The total expenditure of the Company, in actual payments, up to the 31st of May last, was 739,165*l.* 5*s.*; and the directors, in their report of March last, state that, for the finishing of the work, wallings, fences, warehouses, &c., a further sum of 80,834*l.* 15*s.* will be necessary; thus making the whole sum expended on this magnificent and national undertaking, 820,000*l.*

On Dec. 4th, the Planet locomotive engine (Mr. Stephenson's) took the first load of merchandize which has passed along the Railway from Liverpool to Manchester. The train consisted of 18 wagons, containing 135 bags and bales of American cotton, 200 barrels of flour, 63 sacks of oatmeal, and 34 sacks of malt, weighing altogether 51 tons, 11 cwt., 1 qr. To this must be added the weight of the wagons and oil cloths, viz. 23 tons, 8 cwt. 3 qrs.; the tender, water, and fuel, 4 tons, and of 15 persons upon the train, 1 ton, making a total weight of exactly *eighty tons*, exclusive of the engine, about 6 tons. The journey was performed in two hours and fifty-four minutes, including three stoppages of five minutes each (one only being necessary under ordinary circumstances) for oiling, watering, and taking in fuel; under the disadvantages also of an adverse wind, and of a great additional friction in the wheels and axles, owing to their being entirely new. The train was assisted up the Rainhill inclined plane by other engines, at the rate of nine miles an hour, and descended the Sutton incline at the rate of sixteen miles and a half an hour. The average rate on the other parts of the road was twelve miles and a half an hour, the greatest speed on the level being fifteen miles and a half an hour, which was maintained for a mile or two at different periods of the journey.

The annexed Engraving represents Messrs. Braithwaite and Ericson's superb Engine *William the Fourth*—so named by the special permission of his Majesty. It is an engine of about twenty horse power (the cylinder 12 inches—stroke 14,) and, to all appearance, perfectly capable of performing all the work which Messrs. Braithwaite and Ericson have contracted it shall perform—namely, drawing the enormous load of forty tons at the rate of fifteen miles an hour. The external appearance of this engine is remarkably elegant.

REDUCTION IN THE COST OF PRINTING APPARATUS.*

It is well known, by those who have considered the subject, that printing is a power that governs the destinies of mankind:

* From the "British Co-operator," No. 3, into which the article appears to have been copied from the American "Free Enquirer."

and; therefore, those who can control the printing-press can control their fellow-creatures.

While men continue the practice of interfering with the persons and property of each other, it is to be expected that each in his own defence will make use of all the means within his control to increase his power, and to diminish that of others.

At this time, 1830, the means of printing are so expensive, that the great mass of the people are almost totally deprived of their use—while the wealthy few (by their capital, or influence) wield this mighty engine, to increase their own power, and to weaken that of others; and while the ignorance of mankind shall permit them to disregard the happiness of each other, and to limit their mutual encroachment, only by their power, it appears that the equality of power will be the only guarantee for the enjoyment of equal rights.

The fundamental importance of these considerations, induces the subscriber to make known, in the most effectual manner, the result of a series of experiments, instituted with the hope of bringing the printing-press equally within the reach of all.

Preparations for casting types have been made with the expense of about twenty days' labour, with the use of white-smiths' tools, and about five dollars in money. In this department, labour and money expenses have been diminished, in many particulars; the most important of which is, the substituting matrices of lead—stamped with types—instead of matrices of copper, stamped with steel punches; whereby the difficult and expensive business of cutting steel punches is avoided, and the casting of types, which is now monopolized by monied capital, can be effected by almost any person of common intelligence, without apprenticeship, and without dependence on capitalists.

A printing-press has been constructed of a stone platform, and a roller of sufficient weight to give the impression, supported at the ends, by bearers which keep it a proper height above the types, to admit the paper and clothing between. The necessary cost of this press is about five days simple labour; while it requires an experienced workman to make the common press, and it costs from two to three hundred dollars.

Labour and expense have been diminished in other particulars, which cannot easily be described here. It may suffice to say, that the materials employed in this communication, can be manufactured for about twenty-five dollars—twice this size for about thirty-five, and in a smaller proportion as the size increases; while the common printing establishments cost from about four hundred to two thousand dollars.

The existence of an absurd custom (giving the power of monopoly by patents) renders it necessary to state, that any person is at liberty to make use of these simple, yet important, improvements; and any additional information will be freely given.

Preparations are now making to supply those who prefer to

purchase these materials, rather than make them. They will be manufactured and sold upon the principle of labour for labour, of which notice will be given through the medium of "The Free Enquirer," a paper devoted to the great interests of mankind—conducted in New York by Francis Wright, and R. D. Owen.

It may be useful to inform those who are unacquainted with the fact, that the art of using types may be acquired by females or children in a few hours.

N.B.—All communications (for obvious reasons) must be post paid.

Cincinnati, Jan. 30, 1830. JOSIAH WARREN.

COOPER'S ROTARY FIRE-ENGINE.

A COMPANY has been recently established by an act of incorporation from the legislature of the State of Vermont, (U. S.) under the title of the "American Hydraulic Company," for the manufacture of a new description of fire-engine (on the rotary principle,) invented by a Mr. John Milton Cooper, which, if all be true that is affirmed of it, is vastly superior to those in common use. We are assured that Mr. Cooper's engines, compared with others, are more simple in construction, more durable, of less weight, and less liable to get out of order; that they raise double the quantity of water, and discharge it in a more condensed volume; that with proper care they are proof against the effects of frost; that they can be worked with one half the usual power, and cost only one half the usual expense. Nor do these representations rest merely on the authority of the inventer and his partners themselves. Professor Silliman states, in the last number of his journal, that he has "had good opportunities of seeing these engines in full operation;" that he "has been much impressed with a conviction of their superiority over those in common use," and does not think the proprietors "have overrated" their powers. To this decided and weighty testimony in their favour, the professor adds a narrative of some experiments made with engines on Mr. Cooper's plan, of different sizes, which seem to place this superiority beyond all doubt.

"An engine on the rotative principle, of the size marked No. 11, worked by sixteen men, with eleven inches lever, discharged through a four inch pipe, more water than three eight inch cylinders, with nine inch strokes, and fifteen inches lever, worked by thirty-four men—and as much water as four six and a half-inch cylinders, nine inches stroke, worked by thirty-six men with twenty-four inches lever. This experiment was made at the corporation yard, in the city of New York, in September 1827.

"The same engine with twelve men, eleven inches lever, threw more water than two engines (New York and Hydraulion,) in the city of Boston, worked by thirty-six men, with twenty-four

inches lever. This experiment was made in State-street, Boston, in September 1827.

"No. 7, rotative engine with twenty men, exerting an estimated power of thirty-five pounds per man, with seven inches lever, threw from an inch pipe one hundred and fifty-six feet horizontal, and one hundred and nine feet in height. The atmosphere was at the temperature of 42°, and perfectly calm.

"No. 2, rotative engine with eight men, exerting an estimated power of fifty pounds per man, threw from a half-inch pipe, one hundred and forty-eight feet horizontal, and one hundred and three feet in height. The atmosphere was nearly calm, and the thermometer at 53°. The two last mentioned engines were made to discharge a large quantity, without particular reference to power. One constructed for power alone, would probably much exceed either of the above.

"The quantity of water discharged by a No. 11 engine, is five hundred and twenty-five gallons for each hundred revolutions. By a No. 7, three hundred and four gallons each hundred revolutions. By a No. 3, one hundred and twenty-eight gallons each hundred revolutions.

"In the No. 11 engine, the revolving cylinder is thirteen inches long, and eight inches in diameter, and the surface acting upon the water is forty square inches. In No. 7, the revolving cylinder is twelve inches long, six and a half inches in diameter, and it has a surface of thirty square inches. The No. 3 cylinders are nine inches long, five inches in diameter, and eighteen square inches acting surface.

"The result of experiments upon it as a pump proved satisfactorily, that the only deduction from the power applied, after the inertia of the water and pump had been once overcome, was short of seven per cent., including friction. In the old pumps ten per cent. is lost in the reciprocating motion alone, exclusive of friction."

Professor Silliman gives engravings of two of the engines, Nos. 3 and 7, with which these experiments were made, but they exhibit merely their external appearance in different positions—a description of their internal construction being reserved till the proprietors have "secured their invention abroad as well as at home"

To Professor Silliman's own account of this invention there is subjoined a copy of a printed paper issued by the American Hydraulic Company, from which we gather the following particulars, explanatory of the means by which the extraordinary results exhibited in the preceding experiments are obtained:—

"The means by which it raises double the quantity of water.

"The fact is self-evident, that in working the old engines, to discharge the chamber or cylinder once, the piston must pass twice through it; an ascending stroke to create a vacuum, and a descending one to force the

water. Half the time is consequently lost. In the rotative, on the contrary, it is equally evident that a continued vacuum is created, and a continued discharge effected by one and the same operation."

The causes of its being worked with one-half the power.

"The air-vessel is totally dispensed with;* and the power is applied directly upon the water. It operates on no more than it discharges. On the other hand, as a consequence of the alternating motion of the piston engines, twice the surface is acted upon, and the friction, of course, is comparatively two-fold. This is not all. The power necessary to overcome the *inertia* of the water is both exerted and suspended at every stroke of the piston. But in the rotative the current flows instantly, continuously, and uninterruptedly."

It is comparatively proof against frost.

Because "a single revolution of the rotative discharges the ice that may have collected on the surface exposed, and an effective operation is not retarded for a moment. Those acquainted with the old engines, know, by sad experience, the evils of frozen valves and obstructed pistons, and that it is necessary to resort to means of thawing out the machine, or to suffer it to remain useless, even at times of fire."

It discharges a more condensed column.

"Because it dispenses with the air-vessel, it is apparent to the man of chemical science, if not to the common observer, that water, in the form of spray, thrown into an intense flame, is instantly decomposed (giving its oxygen to the carbon to increase its ignition, and its hydrogen to augment the volume of flame,) and, instead of diminishing, increases its fury. The advantage of the rotative herein consists in dispensing with the air-vessel. In the old machine it is indispensible: yet, notwithstanding its use and importance to them, it constantly imparts a portion of air to the water discharged, and thus far produces the evil complained of."†

* "Fire-engines are generally made with one or more piston-cylinders, placed either perpendicularly or horizontally, with solid or valve-pistons playing in them, with a reciprocating motion. In this way one object is accomplished, viz. the discharging of water to a much greater distance than it can be thrown with simple power. But with this advantage there is a disadvantage, inasmuch as the stream being operated upon directly by the power, gives, in its motion, an exact representation of the mode of its application; consequently, the stream is as unequal as the force applied, and, at every change of the piston, stops. To remedy this defect, a vessel filled with air is placed in the vicinity of the piston-cylinder, and the water, ere its final discharge, is forced into the bottom of this vessel, and then allowed to escape. As the pipe, through which the water makes its final escape, is generally much smaller than the piston-cylinder, consequently the motion of the piston will produce compression on the water at every stroke, while the air, in the air-chamber, becomes compressed in like manner. The advantage, then, of the air-chamber is, that this compressed air operates upon the water as a spring, and exerts its power during the suspension of the other power, while changing the brakes."

† Mechanics' Mag.

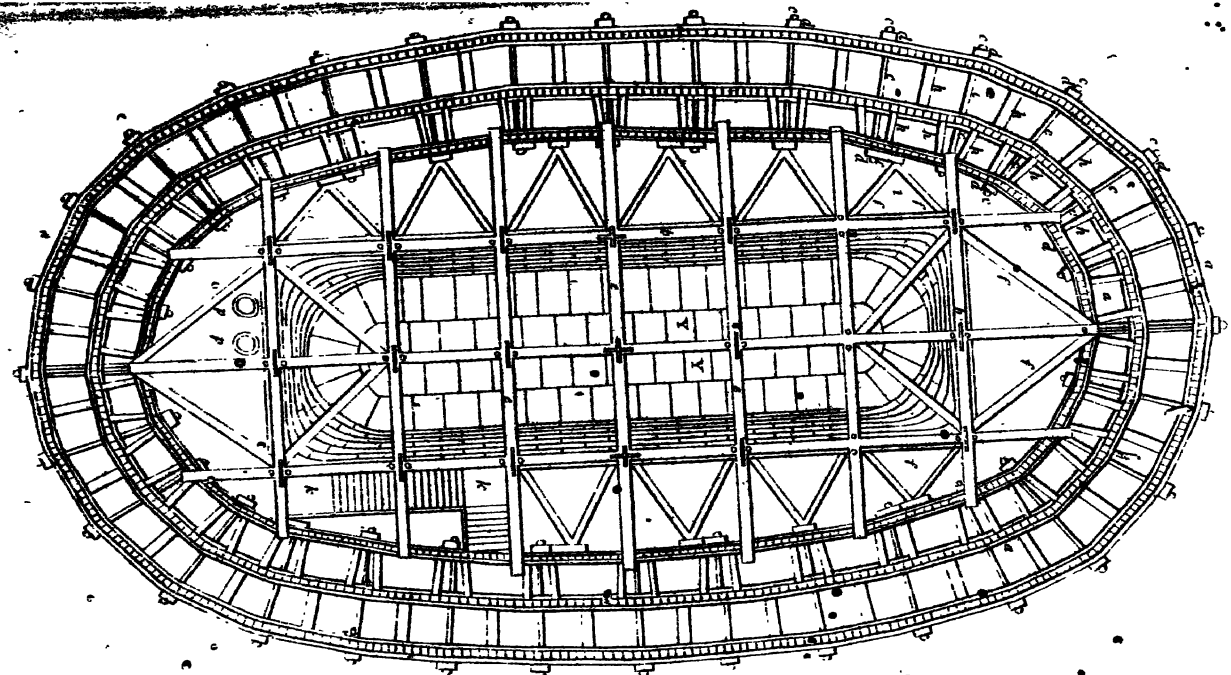
CENTERING OF THE NEW LONDON BRIDGE.

MR. C. DAVY, the architect, has, in the *Mechanics' Magazine* illustrated the Centering of the New London Bridge as follows:

Where a compact body of materials is used for the purpose of forming a concavity, such as groins for vaults, domes,* archways, and occasionally openings nearly square, the framings called centres are fixed, for the farther purpose of upholding those materials which by their density and inclined position could not be supported otherwise, until the cement which connects them is properly hardened by time. To treat upon this subject by itself to its full extent would involve the contents of several papers; the different varieties of centres, therefore, will be described under the heads of the respective bridges they were severally employed in.

The conditions for a centre are very similar to that of roofing, provided a horizontal tie-beam can be introduced, but in navigable rivers this must at times be dispensed with, and then the matter requires greater consideration. We must see in what manner opposing forces are exerted, and act accordingly. 1st. In centre-framing its strength must exceed the weight placed upon its convexity, in the form of the voussoirs, or arch-stones.

* It is possible to construct domes without any centre.



Coffer-dam of New London Bridge

Hutton's Tracts.

2nd. All openings or spaces between the timbers should be triangles. 3rd. All quadrilaterals should be avoided if possible. 4th. Equilibrium should be as much studied in the centre as in the stone arch; for should a weakness discover itself on one side and stability on the other, by the framing being unequally divided, a cripple in the arch itself will be the result.

In all these particulars the present centre of New London Bridge displays a knowledge of the right principles of construction worthy our notice. The prefixed engraving will give an exact idea of its construction, and the contour of the centre arch with its voussoirs. There are about nine of these framings to each arch, boarded over with very stout planking, placed within two or three inches of each other. The centre consists of two parts. The first division embraces the greater portion of the curve at the place where the tie-beam passes through. The second is the part supported on piles driven into the bed of the river; this is fixed. The upper part may accordingly be gradually lowered by removing the wedges, thus preventing any sudden settlement.

Of the *Coffer Dam* employed at the New Bridge Mr. Davy, in the *Mechanics' Magazine,* gives the following description. After explaining the first employment of *caissons* on a large scale in building Westminster Bridge, Mr. Davy thus illustrates the advantage of coffer-dams over building by caissons. A caisson is an immense raft of timber, constructed of a form and size suitable to the pier; it is furnished with a bottom, ends and sides, but the ends and sides may be drawn away: a portion of the pier proposed to be sunk to its proper place is erected in this sort of flat bottom barge; and when all is in readiness, water is admitted in order to sink it, and it is guided in its descent by ropes, &c. The sides and ends are then withdrawn, and float to the surface, the lower planking remaining under the stones.

The caissons at Westminster Bridge contained upwards of 150 load of fir timber of 40 cubic feet each, and were of more tonnage than a 40 gun vessel.* Now it will be seen that by employing such method, the pier rests upon a timber platform. It will be readily conceived that by this means the irregularities in the bed of the river cannot be examined with the facility and accuracy which are obtained by the coffer-dam or batardeaux. One of the dangerous consequences is, that a current or spring may insinuate itself under such platform, and undermine the work to a ruinous extent. Besides, if from any natural cause a very low ebb takes place, the air will be admitted to the unprotected layer of timber, and nothing can then prevent the destruction of the building.

The accompanying drawing (copied with some alterations, from Stuarts "Dictionary of Architecture") will serve to eluci

date a coffer-dam. The pressure of water on all sides of a coffer-dam is so great, that the internal space must be strongly truss-framed to keep it from bursting in upon the work. The three rows of piles, *d d d*, were driven round in an elliptical, form and firmly bolted together at intervals, *c c c* and strong pieces, *h h*, introduced, which are acted upon by compression against the piles by the force of the ambient water: this force is transferred to the braces *f f*, and from thence to the interval and double diagonal framing *f f b*, which receives another force from the direct current of the river. As timber when acted upon laterally is weak, the beams, *e e* and *b b* are framed and strapped together, forming at their abutting joints, *x x x* abutments for those braces acted upon by compression. *p p* are the pumps for withdrawing the water arising from springs or leakage; K K stairs for descending the coffer-gam; and Y Y is the pier of solid masonry with its footings, mode of bonding, &c. The piles forming the dam are finally withdrawn.*

SOCIETY OF ARTS.

THE annual distribution of the rewards of this Society took place in June last. The Earl of Radnor, V. P. in the chair.

Medals were given to J. Peart, Esq., of Settle, for improving waste land; and to W. Blurton, Esq., of Field Hall, near Uttoxeter, for his swing frame for drying cheeses on. Medals and pecuniary rewards were given to Mr. Chancellor, of Dublin, for a remarkably simple clock escapement; and to Mr. Harrison, of Barton-on-Humber, for a clock escapement and a fly, particularly applicable to turret clocks. "Three rewards," the secretary stated, "have been given for inventions, the object of which is to afford the means of escape from a house on fire. To the Chevalier Aldini, of Milan, the gold Isis medal, for his armour of wire-gauze lined with asbestos cloth, which will enable the wearer to traverse a sheet of flame during fifteen or twenty seconds without injury; to Mr. J. Braidwood, of Edinburgh, the large silver medal, for his chain ladder; and a similar one, with the addition of 10*l.* to Mr. Henfrey, for his fire-escape." An improved pack-saddle, and a muzzle for crib-biting horses, were exhibited and rewarded, as well as sundry improved tools, among which Mr. Hilton's conical hollow plane for boring with perfect accuracy the bung-holes of casks, attracted much notice. The large silver medal was presented to Mr. J. Ritchie, F. R. S. for his photometer, or instrument for measuring the relative intensities of light, and therefore capable of practical application in estimating the comparative value of gas from coal, oil, rosin, &c. as sources of artificial light. A silver medal was likewise presented to M. Feuillet, of Paris, for his very simple and ingenious method of removing the impressions of wood blocks and metal plates from the paper on which they were originally printed to other paper. By means of this invention, valuable prints, the paper of which has become stained, mildewed, or otherwise injured, will probably be found capable of being restored. Two beautiful models executed by Mr. R. Cowling Taylor were exposed, and rewarded with the gold Isis

* Mechanics' Mag.

medal of the Society. One of them exhibits the surface of a tract of *country containing about eleven square miles, and forming, perhaps, the* most interesting part of the great coal-field of South Wales, near Pontipool. The other model shows the geological structure of the same district, distinguishing the beds of useful minerals, such as coal, iron-stone, fire-clay, and building-stone, as well as showing the faults or dislocations of the strata, as far as they have been observed. The surveys and measurements, both above and below ground, on which these models were constructed, were made by Mr. Taylor, in the years 1825-6. Rewards were also given for various improvements on the silk-loom, to Mr. S. Dean and Mr. W. Jennings, two ingenious weavers and mechanics of Spitalfields, whereby the complex machinery of the Lyonese loom is greatly simplified, and its action improved. The large silver medal was awarded to Lieutenant H. Lister Maw, R. N. for pigments and other articles collected by him in South America, &c.*

THE DRAW LOOM.

We learn that a very ingenious improvement in the construction of the draw loom, by which the weaver will be enabled to mount one at a comparatively trifling expense, has lately been invented by Wm. Waddeley, weaver, at Springburn, in the vicinity of Glasgow. In his draw loom the whole box and carriage, the most expensive part of the apparatus, are superseded by three small rollers, on two of which the harness is suspended, and the other preserves the tail cords in a horizontal position during the pull of the simple. By this contrivance the great crossing at the neck of the harness is avoided; and consequently from the half to two thirds of the weight of lead will be saved, as well as a considerable part of the tail twine. This must be a very important discovery at the present time, both to the manufacturer and weaver, when harness work, particularly zebras, are much in demand; and certainly has a claim on those interested for some remuneration to the ingenious inventer.†

FRICTION IN MACHINERY.

A paper was lately read at the Royal Society by Davies Gilbert, Esq. the President, on "the methods best adapted for imparting great angular velocities." Equability of velocity is considered by the learned author to be best obtained, though at the expense of some degree of sliding friction, when the outline of the teeth of the wheels are involutes of circles. Friction, on the other hand, is wholly prevented when their form is logarithmetic spirals; but the angular velocities will then be variable. Hence these two advantages are incompatible with one another; but, on the whole, the author gives the preference to the involute, which produces an equability of angular motion. The most advantageous mode of increasing velocity by a series of wheels, is

* New Monthly Mag. † Glasgow Chronicle.

to adjust them so that the multiplication of velocity shall proceed in a geometrical progression.*

COACH WHEELS.

A New York paper gives the following account of an improvement in the nave or hub of the wheels of stage-coaches:—"The hub or nave of the wheel is made of cast-iron, the spokes are driven in as in the common wheel, the inner part or chamber of the hub is 6¼ inches in diameter, and 6½ inches deep. In this chamber eight rollers are placed, four large and four small ones; the large ones are 4½ inches long, and 2¾ inches in diameter; the small rollers are 5¼ inches long, and ¾ of an inch in diameter. The large rollers are placed in the chamber, and surround the axle at right angles; the periphery of these rollers sustain the whole weight of the axle, and rests on the chamber of the hub; they have no axle or journal, and do not come in contact with each other by half an inch. They are kept in their proper angles by means of the small rollers, one of which is placed in the space between each of the large rollers, with which they are brought into contact. The small rollers do not touch the chamber or axle, but are kept in their proper position by means of a flange-ring, on which they revolve. By this arrangement the entire roller motion and principle is obtained, the whole of the bodies revolving around their own centres, and around the main axle, without the use of journals."†

DICK'S SUSPENSION RAILWAY.

Mr. Maxwell Dick, a gentleman of Ayrshire, has exhibited in a room at Charing Cross, the model of a railway on the principle of suspension, which he states to be of his invention, and models also of carriages adapted to it. The exhibition was well deserving of a visit from the admirers of mechanical ingenuity; for whatever may be said of the originality of the plan, too much praise cannot be bestowed on the dexterity with which Mr. Dick has managed to exhibit to the eye on a small scale, all the details of its practical operation, or on the spirit and perseverance which has led him to take this rather expensive method of bringing it under the notice of the public. Our readers do not require to be told that the idea of a suspension-railway is by no means new —that is to say, a railway supported by piers, raised at different intervals, and along which carriages are to travel, wheels uppermost. Precisely the same thing was suggested four or five years ago by Mr. H. R. Palmer, who proposed by means of a single railway of this description to convey goods and passengers in a couple of hours from London to Brighton. We do not suppose

* Mechanics' Mag. † Ibid.

that Mr. Dick was at all aware of what Mr. Palmer had done: he makes no mention of that gentleman in the explanatory description which he has published; and he gives the following very natural account of the manner in which the plan suggested itself to him, and of the preliminary experiments which satisfied him of its practicability:—

"In consequence of a very heavy fall of snow at the beginning of March 1827, much inconvenience was occasioned to the commercial and general interests of the country. For several days the roads throughout the country were completely blocked up, and travelling was wholly suspended. Experiencing, with others, the disadvantages thus occasioned, I thought of recommending to road-trustees the trial of a snow-plough, simple in construction, and trifling in expense. But the design of a railway, on the principle of *suspension*, occurred to me as the one most likely to overcome the whole difficulty; besides, it would afford a safety in rapid communication with light carriages practicable by no other means known to me. Being satisfied in my own mind of the success of the plan, I erected a temporary railway in a private apartment, and made my first experiments with a carriage something similar to those I now exhibit. The result of these experiments seemed so favourable, that I determined to try them on a more extensive scale. Accordingly, in the summer of 1829, I erected a line of poles, extending about two miles, on a farm near Irvine, belonging to his Grace the Duke of Portland. From the one end of this line I laid a rail of *rope*, about half-inch thick, upon which I placed the carriage; and taking the moving power to the other end, I set it in motion, and the velocity gained exceeded the rate of thirty miles an hour. This was over a rope-rail of rough surface; the carriage was twelve pounds in weight, and the diameter of its wheels only two inches and a half. In order to ascertain the power of drag required, I attached a four-pound weight to a line passed over a pulley screwed on the top of a high pole at the one end, and the following was the result:—The first quarter of a mile required a force of four and a half pounds weight to raise the four-pound weight to the top of the pole; the second quarter required a force of five pounds weight—increasing a half pound (or as near it as could be ascertained) in each quarter of a mile. This experiment was made with a spiral steel-yard. The whole weight of line, extending two miles, was six pounds—the force required to drag over pulleys the two miles of line, and to raise the four-pound weight, was eight pounds, or two pounds less than the real weight dragged. This experiment was made with a very imperfect apparatus, or I am convinced the result would have been still more favourable."

"The method proposed for dragging the carriage along the railway is, by fixed or stationary engines, acting with drag-lines or ropes attached to the carriage, which, if the railway be double, will act in an endless round; but if the line of railway be single, then the engine will be interchangeable and reciprocal. The one end of the drag-line is first coiled round the band-wheel of the engine—then passed down on the large barrel-wheel, which coils up the whole; and on the return of the carriage, the barrel-wheel is ungeared from the engine, and the line again passed out. With a train of six half-ton carriages, a water-proof drag-line of half-inch in diameter, will be sufficient upon all stages, unless it be very hilly; then the strength of line, length of stage, and power of engine

must be in proportion: and should the large barrel-wheel be nine feet in diameter and four feet broad, *196 revolutions of this barrel-wheel* will coil a mile of rope; in other words, the build of a five-mile coil upon such a barrel will not exceed *5 inches*; but the strength of line and power of engine must depend entirely upon the level of the country, the weight to be drawn, and the velocity to be obtained. This method of drawing carriages is already well known; but I add, as an improvement to the engine at present in use, two teethed-wheels and two pinions, by means of which a velocity with light carriages is gained, far exceeding any thing before gained by wheel carriages. This engine has hand-cranks upon each axle, which, with light carriages, is intended to be wrought by manual power; but when heavy carriages are to be used, steam, horse, or other power may be applied. A double engine, placed in the middle of a stage of double railway, may keep two carriages in constant motion; and thus, by the alternately active and passive agency of two ropes or lines, the powers of fixed engines are made to act in opposite directions: thereby causing a road to be traversed both ways at once with great despatch. A water-fall, with a double reciprocating engine, in whatever part of the stage placed, may be taken advantage of, or the power may, on the level or slightly inclined stages, be wrought with the light carriages, simply by extending a stationary line, the tension of which would be self-acting by means of weights attached at both ends, and by passing this line once round a barrel-wheel fixed at the bow of the carriage, there might, by the addition of a teethed-wheel and pinion, with light carriages containing four or five passengers, a great velocity be gained; which carriage might be propelled either by the passengers themselves, or by men for the purpose. By this means, one carriage might succeed another in as quick succession as they choose. With the patent friction carriage upon a level stage, the power of one man would be sufficient to take forward a carriage of twelve cwt. at a great velocity; besides, having the power at their own command, they would be enabled to stop at pleasure. Powerful barrel-springs may also be employed to advantage as a moving power in particular situations. The rail-road, however, is the principal object, the moving powers being many, from the spring to 100 horse-power-engines, if required."

For other details respecting the mode of erecting and bracing the rails, and securing the carriages from danger, we must refer to Mr. Dick's pamphlet, which is very circumstantial, and illustrated by nineteen engravings.

Mr. Dick estimates that the cost of a railway on this plan would be only about £1,400 per mile, which is about two-thirds less than the average expense of a ground rail-road. Among the other advantages claimed for it, the most undeniable are these, that a suspension rail "takes a straight-forward point from one town to another, without regard to the surface of the country over which it has to go, whether rising or falling," (a perfect level being obtained by merely varying the heights of the pillars), and that its height above ground "allows every agricultural and commercial intercourse to go on under it without interruption," and excludes every chance of the many accidents which must attend travelling at great rates of speed on ground railways. Mr. Dick admits that such a railway would not be so well calcu-

lated as a ground railway, for heavy weights; but he meets this *objection by remarking, that "by having wagons of half a ton* a greater number may be taken in the train;" and that "with a light rail you will, with light carriages, have the same work done in the end."*

A CASH-REGISTER.

(*See the Engraving.*)

THE cash-register, delineated in the annexed engraving, requires no farther trouble for setting down the most trifling sum, than the mere turning of a hand or index to the required amount, as expressed on a circular scale: this simple operation registers on another scale, enclosed in a locked case, the sum total. The following are references to the diagrams of this machine:

Fig. 1, a front view of the register; A, a circular movable scale, with a hand or finger, B. The scale is divided into a small circle representing one pound, a larger one for twenty shillings, and a third circle on the edge of the card, every division of which stands for one penny, making together two hundred and forty pence. C, a case with the door D, opened to expose a scale with three columns graduated for pounds, shillings, and pence. Above E, and central in the scale, there is a perpendicular screw, having a very fine thread cut on it; on this screw (between C and the figure 1 on this scale) there is a small index, which, having a female screw, ascends, according to the number of revolutions given to the upright screw, by the pinion and wheels, when affected by the motion of B: which wheels, &c. may be seen in the section Fig. 3, and and also in Fig. 4. The hand B is on the seven-shilling division of the circles.

Fig. 2. This figure represents the case closed up, and the circular card, turned so as almost to reverse the central letter, or sign for pounds. It was before mentioned, that in Fig. 1 the finger pointed out seven shillings: now, as it would be awkward to add another sum, by commencing to count from the 7 (or, which is the same, the 84,) the scale is made movable, and without affecting the pinion of the hand, as will be seen hereafter; by this means the lowest figure is brought under the finger, and every fresh calculation begins at the unit. If the scale has more divisions than for one pound, the diameter of the circle should be proportionably increased, otherwise the minuteness of the numbers might lead to continual errors.

In fitting up a machine of this kind, it is not material whether the circular scale be placed perpendicular or horizontal; it is probable, however, that the last would be the most convenient position.†

THE CLIMBING BOY SYSTEM.

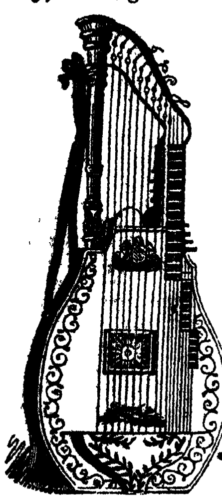
APPLICATION having been lately made by the secretary of the Society for the Suppression of the Climbing Boy System, to the directors of St. George's Hospital to employ the Society's agents in cleansing the flues of that establishment, the following order

* Mechanics' Mag. † Ibid.

was given by the Board.—"Let a fair trial be made of all the flues, in the presence of Bentley, the sweep, and if the machine is found to answer the work shall be put into the hands of the society." Accordingly the 24th of April last was fixed upon for the experiment, and Bentley, his son, and three boys, were met by Glass and Day (the society's agents) and two of their men, and the following terms were agreed upon, viz, that the first chimney should be swept by Glass's machine, and that when this was finished, one of Bentley's boys should be sent up with his brush and scraper; then that the next chimney should be first swept by a boy, and afterwards by the machine, and so on alternately, till the whole (eighteen in number) were completed. The result was most conclusive in favour of the machine; it being agreed by all present that the soot which was brought down by the boys after the machine was one-fifth less than the quantity brought down by the machine after the boys.*

THE PATENT HARP VENTURA.

This beautiful little instrument, invented by Signor Ventura, of No. 48, Cirencester Place, may be seen at the *National Repository*, Charing Cross. The size is 33 inches long, and 14 inches broad; it has 17 strings, and is of an elegant design and appearance. It may be considered as a modification of the harp and guitar, (combining the tones of both those instruments) while it is as portable as the latter. By a mechanical arrangement of great ingenuity, nearly similar in its effects to the pedal action of a grand harp, this instrument is put into any key, which is effected by the pressure of the left thumb on a string; by means of which, the flat or sharp is immediately produced; consequently a key of 4 or 5 flats or sharps may be readily adjusted, and performed in, with the same facility as that of the natural key, much labour is thereby obviated in the performance, and a knowledge of the instrument is very soon acquired. Its compass is rather more than three octaves and a half, commencing with the G below the stave in the treble clef. It is productive of a very fine quality of tone; approximating to those of the harp in the lower notes, and to the guitar in the upper; it also harmonises beautifully as an accompaniment to the voice.†



* Mechanics' Mag. † Register of Arts.

VARIOUS KINDS OF RAIL-ROADS.

(From the works of Tredgold, Palmer, Wood, and Bagster.)

There are three distinct kind of rail-roads, namely, *edge, tram, suspension*, and each of these have some varieties. The oldest and most extensively adopted consisted in laying rails of wood or iron, the carriages being guided therein by flanges on the peripheries of the wheels, and these were called *edge-rails*, to distinguish them from the tram-plates, which came into use afterwards.

EDGE RAIL-WAYS

Were first made of wood in the neighbourhood of Newcastle, for the purpose of conveying coals to the side of the river Tyne; these were next covered with plates of wrought iron in the parts most liable to wear. Cast iron was subsequently introduced there, as well as in many other parts of the country, and now wrought iron is being very generally substituted for the cast.

The wagons run upon the rounded edge of the rail, which is smooth, and laid as evenly as possible. The length of these rails is usually three feet, with a depth of four and a half inches in the middle, and breadth of the top two inches. The ends of the rails rest on a piece of cast iron called a *chair*, and the chairs are fixed to blocks of stone called *sleepers*, (being always in bed,) these have a broad base, and weigh about two hundred each. They are firmly bedded in the ground, and are adjusted to the plane required for the road, before the chairs are connected to them. The goodness of the road depends much on the fixing of the sleepers in a sound and firm manner.

Rails made entirely of malleable iron were first employed by Mr. George Grieve, at Sir John Hope's collieries near Edinburgh; these were formed of rectangular bars, which obviously present too small a surface for the wheels to run upon, or otherwise require more materials than it would be consistent with economy to employ; and to obviate this difficulty, a patent was obtained by Mr. John Birkinshaw, of Bedlington Iron Works, Durham, for an improved form for the bars to be used as rails. It consists in giving the bar the form of a triangular prism, or such variation of that form as is best adapted for that purpose.

The chief advantage of wrought iron rails is that of reducing the number of joints; and the difficulty of making the rails perfectly even at the joints has contributed much towards their introduction.

Edge rails are most adapted for permanent works. They are of such a nature, that ordinary carriages cannot be employed upon them; but on any railway where such carriages can be used, they must do more injury to the surfaces of the rails, than will be equivalent to the advantage of suffering them to go there.

TRAM-WAYS, OR TRAM-ROADS,

Differ from the preceding kind, in having the guiding flanges upon the rails, instead of upon the wheels of the carriages; it gives the advantage of employing carriages that can be used where there are not rails laid down. They are called *tram*-roads, from their being first used for drawing trams upon. The tram-rail is exceedingly convenient for temporary uses, and in its ordinary form it is much used in quarries, in mines, in forming new roads, and in digging canals, in conveying large stones for buildings, and other purposes. Tram rails are of a very weak form, considering the quantity of iron in them, and in some works it had been found necessary to strengthen them, by adding a rib on the under side.

The third kind of railways mentioned are those on the principle of suspension, of which that invented by Mr. H. R. Palmer, is we believe, the earliest and the best.

For permanent roads, the rails are usually fixed by spikes driven into wooden plugs, previously inserted in the blocks of stone for supporting the rails.

An attempt to improve the method of putting down tram-plates, by Mr. Le Caan, affords great facility in taking up or putting down the rails; they are contrived so as to fix one another, without the aid of nailing. The plates are joined by a dovetailed notch and tenon, and an oblique plug is cast on each plate, which is let into the stone sleeper. But, for the advantage of taking up the plates, to repair any defect, there are plates at every thirty yards, with perpendicular plugs; such plates are called stop plates. The diameter of the plug near the shoulder is one inch and three quarters, at the point one inch, its length is two inches and a half, and its obliquity about eight degrees. A small groove in the whole length of the exterior of such plug, is made to allow the water in the hole to expand in freezing, and it also serves to admit a wire to draw a plug out by. The holes for the plugs should be cut to the depth of three inches, by a standard gauge of cast iron, and counter-sunk, so as to allow the end of the plate to bed firmly on the block which supports it.

The usual length of one tram-plate is three feet; the flanch is one and a half inch high; the sole or bed, three and a half or four inches broad, and three fourths of an inch thick; but these dimensions are varied according to circumstances: the most approved weight has been forty-two pounds for each plate. The ends from which the plugs project, under which the tenons and notches are made, should be a quarter of an inch thicker than the other parts of the plate.

In this method the wheels of the wagons cannot be obstructed by the heads of the nails rising above the surface, and the blocks are not disturbed by fixing the plates; and when repairs are necessary, the plates must be formed for the purpose.

When tram-plates are fixed by spikes to stone sleepers, there

is some difficulty in keeping the joint even and in its place, but it seems to be successfully obviated by using a saddle piece to receive the ends of the nails at the joints, an improvement which was introduced by Mr. Wilson on the Trent tram-road.*

ACCOUNT OF AN EXTRAORDINARY ADHESION OF THE SAFETY VALVE OF THE BOILER ON BOARD THE STEAM BOAT, LEGISLATOR, ON THE HUDSON.

By the Engineer.

(To the Editor of the Journal of the Franklin Institute.)

Last summer I was engineer on board the steam boat, Legislator, belonging to Hudson: standing on the forward deck, I noticed that the engine was working faster than common, and not seeing any steam flow as usual from the safety valve, I started for the fire-room, where I met the fireman then on duty; he told me that he had on twenty-one inches of steam, and that the rod in the steam gauge was up against the boiler deck. As the safety valve was loaded to carry only sixteen inches, I became alarmed, and went to the fire-room and took hold of a cord that ran over a pulley, and was attached to the lever of the safety valve, and attempted to raise the valve but could not; I was still more alarmed, and went on the top of the boiler, where the safety valve was, and found all right there, that is, there was no extra weight on the valve; I then slided the weight in to the length of the lever up to the fulcrum, where the weight was merely nominal, still the valve did not rise; I became confounded; I took hold of the lever and lifted on it pretty stoutly, and continued lifting for some seconds, when all of a sudden, with an explosion like that of the report of a small field-piece, the valve opened, and the steam rushed out violently; it continued to do so for some length of time before the steam got down to the usual pressure, the engine being at work all the time. There was no water on the valve, nor any visible obstruction to its rising of its own accord after the steam got beyond the pressure of sixteen inches, which it had invariably done before. Now, sir, must not this obstruction to the valve rising have been caused by an adhesion that took place between the valve and the valve seat, both of the same metal? I think it certainly must have been caused by this adhesion of the metal only. I have had an experience of twelve years as an engineer, and never knew the like occurrence before. For many reasons I have not placed full reliance in the mercurial steam gauge, but have always had entire confidence in the correctness and safety of the safety valve; but in this case I was deceived, and perhaps in a few moments more an explosion might have taken place, for I have no doubt that if the small rod in the

* Regist. of Arts.

steam gauge had had a free passage through the boiler deck, it would have denoted thirty instead of sixteen inches.

It is usual on board steam boats to have the steam gauge so graduated as to show as many inches of steam as the engine will take, and to have the safety valve loaded so as to agree with the steam gauge, believing that when the steam gauge indicated sixteen inches of steam, all the surplus steam would escape through the safety valve. Engineers, or many of them, are in the habit of not blowing off any steam when the boat stops to make a landing, but depend wholly on the safety valve rising of itself after the steam has risen a little above its required height. This has been considered a safe way of proceeding, but the case stated above shows, most conclusively, that it is wrong to depend too much on the safety valve. I would recommend, by all means, that when a boat stops to land passengers, that the safety valve be raised, let the gauge indicate what pressure it may; this, sir, is the only safe way. Might not the engineer of the Helen M'Gregor have placed an implicit confidence in his safety valve rising when the steam had got to its required height, and is it not possible that an adhesion had taken place between the valve and the seat? And perhaps at the same time he was waiting for the valve to rise, he had double the required quantity of steam, which caused the awful explosion—such may have been the fact. Before the occurrence of my safety valve not rising when it ought, I had believed the cause of boilers exploding was almost invariably the want of a sufficient quantity of water. I now think some explosions may be attributed to the being deceived by the safety valve not rising as was expected by the engineer. If you think the above stated facts are worth a place in your valuable Journal, you are at liberty to insert them. You will please to word and arrange this account to suit yourself. I know nothing about making out a statement for a public print, but you may rely on the correctness of the fact above narrated; it can be testified to by the pilot, the clerk, and the fireman of the boat.

New York, Your obedient servant,
April 12, 1830. JOHN B. CALHOUN, Engineer.

Remarks by the Editor.—We insert the preceding communication in the form in which it was received, and shall always be much gratified by the correspondence of observing practical men upon subjects with which they are conversant. The simple, unpretending style in which the foregoing facts are narrated, could not be improved by any effort of ours.

We differ from Mr. Calhoun in his estimate of the value of the mercurial steam gauge, and think that the case stated must convince him of its utility. In order to judge of the cause of the adhesion, the exact form of the valve, and other circumstances relating to it, ought to be known. So far as the account goes, it appears that there was, in the present case, an actual adhesion of the valve to its seat, which, although not unfrequent to a certain

extent, existed with a degree of force which was extraordinary. Our scientific readers are acquainted with that kind of adhesion which was first brought into general notice by M. Clement, of France, and which has since given rise to much discussion: there is nothing, however, to lead to the conclusion that the present case was in any way related to it, as an emission of steam would then have accompanied the adhesion.*

LOCOMOTIVE CARRIAGES.

On January 29th, 1830, Mr. Fordham developed and illustrated at the *Royal Institution*, a plan which he has of transferring the power of fixed and cheap first movers to locomotive carriages, &c. travelling on common turnpike roads. He considers the power of a steam-engine, moving with the locomotive carriage, as very expensive when compared to an equal power obtained by a large ordinary fixed engine, a wind or water-mill, or other common first mover; and conceives, that if the latter could be transferred to the locomotive carriages, the saving in price of power might be far greater than the expense of transference. His plan is to condense air into cylinders, and then to use this condensed air as the motive force. He pointed out the numerous circumstances which seemed to be in favour of this plan; as the diminished weight of the locomotive carriage; the continual diminution of pressure as the carriage proceeded; the cheapness of fixed steam-engine power, &c.; not forgetting to estimate the actual draught required for a carriage, and the sufficiency of the force he proposed applying in giving that draught.†

MECHANICS' INSTITUTES.

At the Anniversary of the Yorkshire Philosophical Societies, the following sensible observations on these establishments were made by Sir George Caley, President to the York Institute, upon his health being drunk:—

The Mechanics' Institute is a humble sister of the same family as the Philosophical Society. Science and Art stand, with respect to each other, as cause and effect, and each mutually aids the progress of the other. I am sorry to say, that though nominally the President of that Society, I am, in fact, from my distant residence, the most inefficient member it has. I am glad, however, to know that our virtual and real President (the Rev. C. Wellbeloved) is here. I shall call upon him to give us the particulars of the present state of the Institution. I may observe, generally, that I am aware that there is a divided opinion as to the utility of such societies; and that many hold a conscientious opinion, that is adverse to them. There seems to be a fear that they may induce the lower orders of society to become too cunning for their

* Regist. of Art. † Philos. Mag.

rulers:—surely society cannot be so constituted by Him who called us into existence, as to become too wise for itself. Even our Philosophical Society has not escaped without similar aspersions, and those from very high quarters; but I do not perceive that we are getting too wise at all. I cannot but believe that the best basis on which to build up the security of the British Government, is on the solid information and good sense of the people, and at the same time it forms the best security for the safe administration of the government. Man is a social animal; when alone he is weak and helpless, but in combination becomes invincible. Almost every man has some mental perfection in conjunction with many deficiencies, but when called together in such a society as the Mechanics' Institute, for mutual instruction and assistance, the best powers of each are brought to bear upon the concerns of all, and many centuries of experience in their united ages are made available towards the common stock. To the powers of combined effort we owe the valuable Institution we are now met to celebrate; without it, all the materials for science would have been scattered unclassed and useless; so beautifully and so surprisingly however are interwoven the laws of creation, that out of these individual deficiencies arise most of the endearing ties of life. Had we all been perfect in our powers, and each as capable as the other in every particular, we should not have perceived the necessity of mutual assistance, and would never have experienced all that series of friendly exertion, gratitude, and affection, which flow from this source.

Upon the health of Mr. Wellbeloved being drunk, he spoke as follows:—

If my name is connected with the York Mechanics' Institute, it is my duty to acknowledge the honour: for I do feel honoured by my connexion with that Institution, under our admirable President, who is always present with us in spirit, though we regret that he is frequently absent in person. We have a very admirable bust of him in the room where we hold our meetings, which always reminds us of him; at the same time we are sorry that we have only his bust. When the York Mechanics' Institute was set on foot, I took an active part in promoting it. I am proud that I did so; for it is a valuable Institution, and I am convinced that its tendency is good. I was told in the outset, that I should do a great deal of harm; that society would be disorganized; that we should have no subordination, no inferiors; that apprentices would be no longer bound by their indentures, but would rise into journeymen; that journeymen would leave their masters, and set up as masters for themselves; that we should have no servants; and in short, that we should have nothing but confusion. I have seen nothing of this—I have heard nothing of it—of nothing approaching to it. But I will tell you what I have seen. I have seen a number of young people assemble night after night, for the purpose of completing their neces-

sarily deficient education. I have seen others meet to improve themselves in architecture or drawing; others attend lectures, and express the greatest anxiety to procure information. I have seen them devote hours, too frequently devoted to debauchery and dissipation, to the investigation of subjects interesting to all human beings: and seeing this, I rejoice that I have been enabled to do any thing to forward their views. I have seen too, a number of young persons come, night after night, to the library,—which, I regret to say, is not so well furnished as it ought to be,—for books, which they carry home with them, to read by their firesides; instead of being induced to seek for recreation in the haunts of idleness, and among idle companions. Since the commencement of this benevolent Institution, I have seen nothing else arising from it; and as long as this is the case, it shall have my services, and all the time I can bestow on it. I think we are all bound to support such Institutions. We have Infant Schools, Sunday Schools, National Schools, and Lancasterian Schools. What are they for, but to enable the population to read? When they are taught to read, will they not read? And what will they read? Are they to be left without guides to direct them what course to pursue? Mechanics' Institutes come in aid of these schools, to give the people proper books; and to keep them out of improper courses, which they would otherwise fall into. I believe that the members of Mechanics' Institutes will not fall into those false and erroneous opinions to which allusion was made in the morning. By instructing them, and cultivating their minds, we shall preserve them from the arts of Carlile and others, who go about the country to induce the ignorant and uninformed to embrace their erroneous and dangerous doctrines. I can see no objection to such Institutions; and I am happy to say, that not only Sir George Cayley, but our worthy President himself, is enrolled amongst the members of the York Mechanics' Institute; and I wish such examples were more generally followed. If, Sir, (addressing the Chairman) all in a similar rank to yourself would act as you do, and those who support you,—if they would employ their advantages in the same manner, there would be no danger of their ever being overtaken by their humbler brethren; they will always keep their station; and however long the spur may be in the toe of the mechanic, it will never reach the heel of the aristocracy.*

IMPROVEMENT IN THE SMELTING OF IRON.

Heated air for blast furnaces has been used for some time at the Clyde Iron Works, and with great success. Experiments have proved that iron is smelted by heated air, with three-fourths of the quantity of coal required, when cold air, that is air not arti-

* Philos. Mag.

ficially heated, is employed for that purpose, while the produce of the furnace in iron is at the same time greatly increased. All the furnaces at Clyde Iron Works are now blown with it. At these works the air, before it is thrown into the blast furnaces, is heated 220° of Fahr. in cast iron vessels placed on furnaces, similar to those of steam-engine boilers. It is expected that a higher temperature than 220° will be productive of a proportionally increased effect. But this is a subject of experiment. It is supposed that this improvement will accomplish a saving in the cost of the iron in Great Britain, to the amount of at least 200,000*l.* a year.*

ELASTIC POWER OF STEAM.

MM. Arago, De Prony, Ampère, Girard and Dulong, constituting a committee appointed by the French Academy to determine the elastic power of steam at high temperatures, have given the following table as the results of their investigation:

Elasticity of Steam atmospheric pressure taken as unity.	Corresponding temperature on Fahrenheit's scale.	Elasticity of Steam atmospheric pressure taken as unity.	Corresponding temperature on Fahrenheit's scale.
	deg.		deg.
1	212·00	13	380·66
1½	233·96	14	386·94
2	250·52	15	392·86
2½	263·84	16	398·48
3	275·18	17	403·82
3½	285·08	18	408·92
4	293·72	19	413·78
4½	301·28	20	418·46
5	308·84	21	422·96
5½	314·24	22	427·28
6	320·36	23	431·42
6½	326·26	24	435·56
7	331·7	25	439·34
7½	336·86	30	457·16
8	341·78	35	472·73
9	350·78	40	486·59
10	358·88	45	499·13
11	366·85	50	500·60 †
12	374·00		

MANUFACTURE OF PAPER FROM ULVA MARINA.

The following is the specification of a patent for manufacturing paper from a material not heretofore used for that purpose. Granted to Elisha Hayden Collier, of London, but late of Plymouth County, Massachusetts, April 15, 1828.

* Jameson's Journ. † Le Globe.

The following is the description of my mode of manufacturing paper from a marine production, or sea grass, designated by botanists, as "*Ulva marina.*"

First: all rock, roots, and shells, to be carefully separated from it.

Secondly, the dust to be cleared from it, by beating it.

Thirdly: to be steeped in lime-water, in order to discharge the salt from it, and thus prevent decomposition.

Fourthly: to be partially pulverized. It can be bleached perfectly white by the use of oxymuriate of lime, otherwise called chalonic acid, (chloride of lime.):

Fifthly: to be made into pulp in the usual manner, either by beating, or in a paper engine.

Sixthly: to be dipped, pressed, sized, and dried in the usual way.

As the sea-grass, or Ulva marina, is capable of being manufactured into paper by other modes than that described, I claim as my invention, the manufacture of paper from the said sea-grass, or Ulva marina, not by any particular mode, but by any process whatever which it may undergo; and whether such paper is composed entirely of the said sea-grass, or Ulva marina, or mixed in any proportion with other materials heretofore known, or used for the manufacture of paper.*

STRENGTH OF WINE AND OTHER BOTTLES.

M. Collardeau has constructed a machine for the purpose of trying the strength of wine bottles. It has been presented to the Academie des Sciences, and reported upon by M. M. Hachett and D'Arcet. The bottle to be tried is held at the neck by means of a lever, having three branches, which grasp it below the ring; being then filled with water, it is connected by means of pipes, with a forcing-pump, the pipe having a cap furnished with leather, which is firmly held down by the apparatus upon the mouth of the bottle, the pressure upon the parts here increases with the pressure of the water within the bottle. Besides the pump, levers, and connecting pipe, there is also a manometer connected with the interior of the bottle, to show the pressure exerted. When a bottle is burst in this way by the hydraulic press, no violent dispersion of its parts takes place, unless indeed, in place of being filled with water, a portion of air is left in; then when it breaks it flies to pieces, and would cause danger if exposed.

Bottles intended for the manufacture of brisk champagne or burgundy, being tried, were found to break with a force between twelve and fifteen atmospheres; exerted from within outwards, a few rose to eighteen atmospheres. Bottles which had contained champagne of the finest quality, broke at the same pressure.

* Journ of Franklin Institute.

Bottles which resisted the pressure of twelve atmospheres usually broke with one or two atmospheres more, but the number of these was small. The fracture of bottles in the manufacture of brisk champagne is from 10 to 20 per cent.; and in certain cases, which, however, are rare, almost the whole have been broken. It appears quite certain, that during the fermentation of the wine, the pressure rises above twelve atmospheres, but the full extent can only be ascertained by careful experiments made by the wine proprietors.

The commissioners then remark, that the best bottles intended for brisk wines are too weak; the general fault is want of strength and uniformity in the belly of the bottle, especially at the junctions with the neck and with the bottom.

As the greater number of bottles for brisk wines are of the same quality, it becomes a question why some should break and others not. This difference is supposed to depend upon the form of the neck and quality of the cork, allowing a little gas to escape in some cases and not in others. If the bottles and corks were all alike, all those which contained the same liquor at the same temperature would probably break at the same pressure. The only means of avoiding fractures is, either to make the bottles sufficiently strong, or to allow a little escape of gas by the cork. The least thickness of glass in the belly of the bottle should be two millimetres, (079 of an inch,) but generally it is only one millimetre at the part next to the bottom.*

ALLOY FOR THE CONSTRUCTION OF PUMPS AND COCKS.

This alloy consists of four parts of tin, four of zinc, and one of antimony; these metals, when fused and well mixed together, have been found well suited to make good pumps. Cock metal is usually an alloy of lead, zinc, and antimony, to which more or less tin is added. The alloy described as good for pumps, is fit for cocks, but one to be mentioned is still better: of the two parts of a cock, namely, the box and the plug, the latter should be rather harder than the former, and therefore contain more antimony. An alloy of 80 parts of tin, with 20 of antimony, is well suited for the plug, and one consisting of 86 parts of tin, 14 of antimony, for the boxes of cocks.†

PATENT IMPROVEMENTS IN BLOCK PRINTING.

By John Applegath, Crayford, Kent, 1829.

The improvements for which this patent has been granted, are produced by an apparatus, which will facilitate the accurate arrangement of the square blocks employed in calico-printing when used successively for the continuation of a given pattern. This

* Bull. Univ. † Industriel de Bruxelles.

apparatus is composed of two principal divisions, the first being of the nature of a table or stand, on which the calico, or other stuff required to be printed, is to be laid to receive the impression of the blocks, and the second consisting of a frame that fulfils the chief purpose of the object of the patent. The table, or stand, is made of horizontal stone slabs, a little exceeding the breadth of the stuff, and of the same length, being intended for printing handkerchiefs or shawls. These slabs are placed successively in one line, within about an inch of each other, on parallel brick walls, of between two and three feet in height, and over them a thick piece of blanket, or other proper woollen stuff, is laid, which is either nailed to pieces of wood fixed beneath the intervals between the stone slabs or is kept down by metal rods placed across in the same intervals, and passed through staples secured to the walls at each of their ends. A frame is then prepared to lay over this table, containing as many square compartments as there are slabs, which is fastened at one side of the table to hinges, that project from each of the supporting walls for that purpose, which allows the frame either to lie horizontally in close contact with the slabs, or be raised up vertically when the calico, or other stuff is being laid on the slabs, or removed from them. At one extremity of this table of slabs a row of tenter hooks is placed across, to which one end of the piece to be printed is fixed, and it is then laid evenly over the slabs, and fastened down in the intervals between them by the rods passed through the staples before mentioned, after its farther end is drawn tight by means of a cross bit of wood to which it is attached, by a similar row of tenter hooks, that is either fastened to the other end of the table by cords, or is drawn towards that end by weights attached to the extremities of the same cords. Supposing the calico or other stuff to be arranged and fastened down evenly over the table of slabs, and the frame to be let down horizontally, in contact with its surface, a block is then to be taken, having a fourth of the area of one of the square compartments of the frame, on which the pattern preferred has been cut, so that the joinings of the figure may fit acurately, on shifting its position; and the colour having been applied to its face, either by dipping it on the colour sieve, or by colour rollers, it is then to be pressed down by a blow or other means, in one corner of the first square compartment of the frame, then in the next corner, and so on successively through the other remaining corners, care being taken to keep the proper angle of the block next the corners of the compartment; one handkerchief or shawl being thus stamped, the same process is to be repeated in all the other compartments of the frame, until the whole piece is completed. When a medallion or other central figure, is to be impressed on the middle of the handkerchief or shawl, then a movable frame is to be formed of four pieces of wood, of the length of one of the compartments, crossed so over each other (by dividing the joinings) as

when laid in the compartment, to divide its area into nine equal squares; in the central square of these, a block, having the whole of the intended medallion, or other figure, cut on its face, is then to be stamped in the manner before described; or a block, having a quarter of the same figure cut on it (and, of course, only a fourth of the area of the central square,) may be used, and the impression be made of the whole figure by four successive operations, in the same way as with the larger blocks in the process first recited. When only a border is to be stamped on a shawl or handkerchief, the patentee directs that a block of another shape be used, which is to be of the breadth of the intended border, and of such a length as to extend from one angle of the square compartment of the guiding frame to within a distance equal to its breadth, of the adjoining angle, and the pattern proper for the angle of the border, having been cut at the end of the block, placed in the first instance close to the angle of the square compartment; at the next transfer, that end of the block is to be laid in the space left at the extremity of the first impression where it will form the second angle of the border; and the block being applied successively at the other sides of the compartment in the same manner, will, at the fourth impression, complete the border.*

NEW STEREOTYPE PLATE.

The improved plate is intended for maps, and other subjects in which drawing and lettering are combined. Blank type quadrats, or spaces, are to be cast of the usual height of type, so that when set up they will stand even with the face of the letter. These are to be set by the compositor with the required names standing in their proper places; from this a block is to be cast in the usual way of forming stereotype plates, when the lines of the map or other drawing are to be formed by the graver.†

THE AMERICAN LAW OF PATENTS.

The first step in the process is the payment of about 6*l.* 15*s.* or thirty dollars of American currency, into the patent office The applicant obtains duplicate certificates of that payment, and takes one of them to the office of the Secretary of State, to whom, at the same time, he presents a petition applying for a patent for his invention, describing it shortly. He annexes to the specification, which generally accompanies the petition, an oath, that he is the true discoverer of his invention, and that he is a citizen of the United States; those two facts are all that is required in the affidavit. The Secretary, if there be no interfering application, immediately assents to the letters patent being granted,

* Regist. of Arts. † Franklin Journ.

and the papers are then taken by the applicant to the patent office, where the specification signed by himself, and attested by two witnesses, is then lodged, accompanied with drawings; and if it be a description of a machine, also with a model, if the secretary directs it shall be so, in order that there shall be no mistaking the exact nature and extent of the invention. This whole process may be accomplished in *half a day* if there were a person on the spot to attend to it, and if the necessary writing could be made within that time. When the letters patent are prepared for signature and sealing, they are submitted to the Attorney-General of the United States, who within fifteen days, if he finds them to be conformable to the Acts of Congress on the subject, returns them to the Secretary of State, who presents them to the President for signature, and causes the seal of the United States to be affixed to them. After being recorded in the books of the proper office in the department of state, the letters are delivered to the patentee or his order.

Previous to a patent being granted, if there be a conflicting application, the parties are required, each of them, to nominate an arbitrator, the Secretary of State nominates a third, and this arbitration decides which of the claimants is entitled to the patent.

The right of a patentee descends to his heirs—he may dispose of it to any body without limitation. If an inventer dies previously to securing a patent, his heirs, or his devisees have a right to take out the patent after his death, in the name of the executor, or administrator, as trustee. A patent right may be disposed of to any number of persons. American patents are granted to foreigners if they have resided two years in the United States, but congress has the power of dispensing with the two years residence by special act.

In England a patent is granted as a reward to any person for bringing an invention to the knowledge of the public, whether he be the inventer or not. In America it is granted only to the inventer. There are no patents of importation. Nevertheless, Americans are not required to make affidavit that the invention has never been made known or used in any foreign country. A foreigner is obliged to make that oath, but an American may be presumed, of course, to have orignated all his inventions within his own country!

The number of American patents taken out annually is about 200. (Mr. Aspinall's estimate is very far below the actual number.) The whole official expense of an American patent is 36 dollars, but the party may, possibly, go to a lawyer, to have his petition drawn up, and to have his papers put in order, for which the highest rate of compensation there is about 4*l.* 10*s.* so that the whole expense of a patent would seldom exceed about eleven or twelve pounds.

The Model Office, where all machines are deposited, is at present a respectable museum.*

THE SPANISH LAW OF PATENTS

WHICH is contained in a law passed by the cortes, on the 2nd of October, 1820, and which was sanctioned by Ferdinand the Seventh, on the 14th of October, 1820. The chief points are as follow:—

The inventer of a new machine or process is entitled to a patent for ten years. The improver of an old machine can only have a patent for six years; and the importer of a foreign invention only five years. An act of the cortes can extend the period in particular cases, not exceeding in the whole, fifteen years to the inventer, ten years to the improver, and six years to the importer. The whole extent of the patent is, to the inventer 2,000 rials, to the improver 1,200 rials, and to the importer 1,000 rials, one half to be paid at the time of petitioning, the other half on receiving the patent; the specification to be presented at the time of petitioning. The specification is open to public inspection, except in particular cases, at the discretion of the government. Any number of partners may hold and work a patent.†

INVENTION OF STEREOTYPING.

THE honour of this important invention is at present claimed by Holland, apparently with justice. Baron Van-Westreemen Van Tiellandt, encouraged by the government, has made very active researches on this subject, and has received from the booksellers Luchtmans of Leyden, a stereotype form of a Bible, in 4to., from which impressions have been taken since 1711. At Haarlem also, the booksellers Enschedé have furnished him with another stereotype form of a Dutch Bible, which dates from the first years of the 18th century. These are two substantial proofs of stereotyping in Holland before it was thought of in France. It is well known that, in a note annexed to No. 1316 of the catalogue of Alexander Barbier, a note extracted from the papers of Prosper Marchand, it is affirmed that John Muller, minister of a German church at Leyden, contrived, about 1701, a new method of printing, similar to stereotyping as now practised. The method of John Müller consisted in composing the letters in the common way, correcting these forms very exactly, binding them in a very solid manner in frames of iron, then inverting the letters, and riveting them with metal, or, still better, with mastic. The first essay of this method was a small prayer-book, entitled Gebeede-Bookjen, Van Johan Haverman, printed in 1701, by

* Evidence before Select Com. House of Commons. † Ibid.

J. Muller, son of the inventor. This method of printing was afterwards transported to Halle. In a letter of the 28th of June, 1709, Muller acknowledges that he had printed in this manner, a Syriac New Testament, with a Lexicon.*

In June 1801, the Messrs. Luchtmans addressed the following letter to M. Renouard of Paris, which has been published by M. Camus, in his History of Stereotyping:—"We have sent you a copy of our stereotype Bible, which we take the liberty of offering you as a work truly interesting in regard to the history of the art. All the plates of it are now in our possession, and notwithstanding that many thousand copies have been printed from them, they are still in very good condition. They are formed by soldering the bottoms of common types together, with some melted substance, to the thickness of about three quires of writing paper. The plates were made about the beginning of the last century, by an artist named Van der Mey, at the cost of our late grandfather, Samuel Luchtmans, bookseller. The same artist, at the same time, and in the same manner, also prepared for our grandfather the stereotype plates of a folio Dutch Bible; these plates are at present in possession of the bookseller Elwe; and afterwards of a Greek New Testament, on Brevier, and of 24mo. size, the plates of which are still preserved by us. The last work which this artist executed in this manner, was the *Novum Testamentum Syriacum et Lexicon Syriacum*, by Schauff, 2 vols. 4to.; a work sufficiently known. The plates of this last work have been destroyed. These instances comprise, as far as our knowledge extends, all the attempts of this kind which have yet been made in this country." The plan of stereotyping here described,—"by soldering the bottoms of common types together by some melted substance,"—is very different from that now in use. A mould of plaster of Paris is formed from a page of common type, in which a thin plate is cast, containing a *fac simile* of the face only of the page, and which is afterwards mounted on wood to the necessary height for the press. There is no means of accurately ascertaining by whom this important improvement in the art was first effected. Our neighbours across the Channel claim it upon the authority of some old plates of a Calendar to a Prayer-Book, very rudely and imperfectly formed of copper, and without a date, but supposed to have been made about 1735. We cannot think, however, of yielding on such proof the merit of the improvement in the invention, when on this side the water we have positive names and dates of about the same period, to show that the art was then practised in this and the sister kingdom; by Mr. Ged of Edinburgh, in 1725, and by Mr. Fenner and Mr. James of London, who absolutely cast plates for Bibles and Prayer-books in the University of Cambridge, in the year 1729-30.†

* Bulletin Univers.

† Professor Jameson.

PERSPECTIVE.

It is probable that we have now a far greater number of amateur draughtsmen than any age has known—naval, military, and private tourists, male and female; and their published travels contain an immensely greater display of sketches and descriptive plates than heretofore; and their private portfolios, of elegant drawings. The utility of this practice is not ill appreciated in society; and the pleasure it affords to the tourist and to the reader is very generally acknowledged. It is therefore somewhat surprising that the study of perspective should prevail so little. Is it the fault of the books, the teachers, or the scholars? Is it the fear of the undertaking, or want of perception of its value, that indisposes amateurs to undertake this study? It must be acknowledged that some of our first masters have been careless of perspective up to a certain degree; but the neglect appears in general in the subordinate parts only of their pictures; still their inattention, even in this degree, has left an example, which, being on the indolent side, is too readily followed by artists of inferior talent; and it deceives the eye and habituates it to incorrect representation.

Notwithstanding, however, this unperceived morbid habit, good perspective is always pleasing. The untutored eye catches the effect, and perceives unexpectedly the resemblance to nature. Who is not delighted by the magic of the dioramas? But (without more than mentioning those specimens of the art) who does not feel pleased with a true representation of even the simplest scene, where the surface of a road-side pond appears level and flat—where the street in a country town appears to open to the spectator as though he could trot along the hard ground where the boy's hoop seems balanced as it runs on the pavement? While, on the other hand, however finely a picture may be coloured, or however beautifully pencilled a drawing, how lost is the effect when the artist has not taken the pains to consider where his horizontal line is, or has not known to what points his vanishing lines should tend! The spectator feels at once, though he may not know why, that the figures appear not to stand on the ground;—that the two sides, whether of a cathedral or of a cottage, look like one long face;—that the water slopes;—or that even a round tub appears bigger on one side than the other.

Perspective is the first requisite—the *sine qua non* of picture. Picture is the representation of *space* and *bulk* on *superfices*. It consists in *form, light and shade*, and *colour;* but form comes first—drawing. Now the form of one and the same object varies infinitely, in the infinite variety of positions in which it is viewed; and the representation of that form, *according to that position*, is perspective; which, therefore, is the first essential of picture.*

* Philos. Mag.

BROWN'S MICROSCOPICAL OBSERVATIONS ON THE PARTICLES OF BODIES.

MUNCKE, of Heidelberg, finds the following a simple and easy mode of showing the motions of particles:—Triturate a piece of gamboge, the size of a pin's head, in a large drop of water on a glass plate; take as much of this solution as will hang on the head of a pin, dilute it again with a drop of water, and then bring under the microscope as much as amounts to half a millet-seed: there are then observable in the fluid small brownish yellow, generally round (but also of other forms) points, of the size of a small grain of gunpowder, in distances from one another of 0·25 to 1 line. These points are in perpetual slower or quicker motion, so that they move through an apparent space of 1 line, in from 0·5 to 2 or 4 seconds. If fine oil of almonds be employed in place of water, no motion of the particles takes place, while in spirit of wine it is so rapid as scarcely to be followed by the eye. This motion certainly bears some resemblance to that observed in infusory animals, but the latter show more of voluntary action. The idea of vitality is quite out of the question. On the contrary, the motions may be viewed as of a mechanical nature, caused by the unequal temperature of the strongly illuminated water, its evaporation, currents of air, and heated currents, &c. If the diameter of a drop is placed at 0·5 of a line, we obtain, by magnifying it 500 times, an apparent mass of water of more than a foot and a half the side, with small particles swimming in it; and if we consider their motions magnified to an equal degree, the phenomenon ceases to be wonderful, without, however, losing any thing of its interest.*

LAW OF PATENT INVENTIONS.—WATT'S STEAM-ENGINE.

(*From the Evidence before the Select Committee of the House of Commons.*)

(P. 140.) Do you believe that many useful inventions would never have been prosecuted to the public advantage, if they had not originally been worked under a monopoly?—Mr. Watt's steam-engine may be quoted as a great example. At the time Mr. Watt made his invention in his own mind, in 1765, he was not a maker of steam-engines; and none of the makers of that day had sagacity enough to see the value of his discovery before he had made an engine; nor would any of them have prosecuted his plan before it was proved, even if he had made them a present of the invention, much less to give him any thing for it: hence he had no means of making any profit from his invention, or any prospect of repayment for the great expense and labour necessary to bring it to bear in practice, unless he could have secured it to himself for a long term. (P. 141.) The history of

* Jameson's Journal.

Mr. Woolf's invention is very similar, with the difference that Mr. Watt having, through Mr. Boulton, obtained an extension by act of parliament, he acquired a large fortune during the prolongation. Whereas Mr. Woolf's patent expired before the actual outlay had been repaid; so that he is left a real loser by his invention. The previous inventers of steam-engines, Mr. Savary in 1698, and Mr. Newcomen in 1713, were similar cases;—they lost money.

(P. 174.) Mr. Watt's invention, and the perfection he gave to it during the operation of this act of parliament, has proved of more value to the nation than can be calculated; probably as much as the inventions of Lord Dudley for smelting iron by pit-coal in 1619, or as those of Hargrave, Arkwright, and Crumpton, for spinning machinery, about the same date as Mr. Watt. Dudley and Hargrave were not encouraged, but were persecuted, and their works destroyed by mobs; after Dudley's death his process lay dormant during a century, probably for want of support to him. These great inventions have had a close connexion, and each one has promoted the progress of the other very greatly.

(P. 191.) Mr. Watt's is the most striking case amongst that very few where the inventer has been protected in his patent rights, for an adequate length of time, to enable him to perfectly establish his invention, and consequently recompense himself from the use of it. The great perfection which Mr. Watt attained, and the very general use into which he brought his steam-engines, for a great variety of applications, was entirely owing to that protection; and it is certain, that the public would not have been benefitted any thing like so much, if his patent had not been prolonged by parliament. Messrs. Boulton and Watt realized large fortunes by the patent. In addition to their profits as engine-makers, they took one-third of the annual savings in fuel made by their engines, compared with Newcomen's atmospheric engines performing the same work; that produced them a great revenue from Cornwall, where coals are dear, and the engines for draining mines are very large and numerous.

The steam-engine is an invention from which the nation has derived immense wealth during the last century, and increasing means of wealth for the future. After the ennunciation of the principle of action had been made by De Caus in 1615, and by Papin 1690, the real inventers of the engine have been, Savary in 1698, Newcomen in 1713, Watt in 1769, Trevethick in 1802, Woolf in 1804, and Fulton, in America, 1807. Of these Mr. Watt is the only one amongst us who has derived any adequate advantage or recompense for his labours. Mr. Woolf's failure of a recompense was entirely owing to the want of protection by an extension of his term; for his engines came into very general use in Cornwall soon after the expiration of his patent, in place

of Mr. Watt's engines; and with such great advantage in economizing fuel, that Mr. Woolf would have been amply recompensed if his term had been made as long as Mr. Watt's was.

EXTRAORDINARY AND IMPORTANT EXPERIMENTS WITH CANAL BOATS AT HIGH VELOCITIES.

We extract from the "Edinburgh Advertiser" the annexed account of some experiments, which prove (what we have always thought) that high velocities are attainable by properly constructed vessels, upon canals, or narrow waters, without raising a great wave, and consequently injuring the banks.

"We regard the experiments described below as extremely important. If the result is correctly stated, and if no counteracting disadvantage has escaped notice, we think these experiments may be said to have added a million sterling to the value of canal property in Great Britain, since they must at no distant period, add fifty or a hundred thousand pounds to the annual dividends. Nothing can be more paradoxical or startling in appearance than this result; and yet our knowledge of the many unexpected truths in mechanical science which experiment has brought to light, will not permit us to reject it as incredible. It is this:—*that the surge generated in a canal by the motion of a boat, and which is so destructive to the banks, in moderately rapid motion,* (such as four or five miles an hour,) *ceases altogether when a high velocity is employed.* It is true the vessels were of a particular construction, but this is immaterial. A boat sixty feet long and five feet wide is capable of being extremely serviceable, both for the conveyance of goods and passengers; and if such a boat can be safely and conveniently dragged at the rate of nine or ten miles an hour upon our canals, passengers by this species of conveyance will be upon a level, as to speed, with those who travel per mail. The great recommendations of canal carriage at present are, its cheapness, and the liberty of locomotion which passengers enjoy. Its leading disadvantage is, its slowness; and this is felt now more and more, when our stage-coaches are touching a speed of ten miles an hour, which will soon be doubled on our railways. We have not technical skill enough to know what a gig-boat is; but we infer from the other particulars stated, that it must be flat-bottomed in the cross section, pretty well curved upwards at stem and stern, and very light. With this form, the quicker it is moved, the less water it will draw. At a very high velocity, it will merely skim the surface as it were; the displacement of the fluid will reach only a few inches down; and this circumstance, with the quick motion of the boat, causing a re-adjustment of the equilibrium of the water equally rapid, the necessary time will be wanting for the motion to propagate itself beyond the narrow zone of water which immediately encompasses the boat. Such is our hypothesis, supposing the fact to

be as stated. We have a strong impression, however, that the result depends chiefly on the form of the boat, and that a much greater breadth than five feet will be no material disadvantage, except where the canal is extremely narrow."

"Some months ago, by the suggestion of Mr. William Houston, of Johnstone, the committee of management of the Ardrossan and Paisley Canal were induced to make certain experiments for ascertaining the rate of velocity at which a light gig-boat might be propelled along that canal. The experiments were made with a gig-rowing boat of about thirty feet in length, constructed by Mr. Hunter, boat-builder, Brown-street, Glasgow; and this boat, with ten men on board, was drawn two miles along the Ardrossan or Paisley Canal, in the space of less than ten minutes, without raising any surge or commotion on the water—the force employed being one horse, rode by a canal driver. No account of this trial has ever been given to the public, but it was so satisfactory as to induce the committee of the Ardrossan Canal to contract with Mr. Wood, of Port-Glasgow, for a gig-shaped passage-boat, sixty feet in length, and five feet in breadth, fitted to carry from thirty-six to forty passengers. In the month of April last, a number of experiments were made in the Forth and Clyde Canal with two gig-boats fixed together, constructed by Mr. Hunter, and thus forming what is called a twin-boat. The object of these trials was to ascertain the rate of speed at which vessels might be propelled along that canal, and the effect of a light double or twin boat, in giving that degree of steadiness which it was apprehended would be so much wanting in a light single boat. A statement of these experiments on the Forth and Clyde Canal has already appeared in the newspapers, and the only fact therein mentioned, which it seems necessary to repeat here, is the remarkable circumstance, that the quicker the boats were propelled through the water, the less appearance there was of surge or wave on the sides of the canal. The result of the experiments was so satisfactory, that a twin-boat of a gig shape, sixty feet in length, and nine feet broad, was built by Mr. Hunter, Brown-street, Glasgow, and launched in the Forth and Clyde Canal in the course of the following month."

"The single gig-shaped passage-boat contracted for by the Ardrossan Canal Committee, was launched at Port-Glasgow on Wednesday seven-night, the 2nd of June, and she was towed up to the Broomilaw, and thence carried to Port-Eglinton the day following; and on Friday, the 4th of June, a trial, of which the following is an account, took place. The boat is sixty feet long, four feet six inches breadth of beam, and drew on an average, including a deep keel, ten inches when light:—

"From the great hurry in which this trial was made, it was done under many disadvantages. The boat started from Port-Eglinton for Paisley a few minutes after one o'clock, with twenty

persons on board, and the distance from Port-Eglinton to Paisley *being seven miles,* was accomplished in one hour and seven *minutes. The rider was ordered to start and proceed the first mile or so at a very moderate pace, but even at this moderate* pace the wave raised in front of the boat was very considerable. A high wave was seen on the canal preceding the boat, about eighty or ninety feet in front, and in some cases farther, and causing an overflow at the bridges, and in the narrow parts of the canal. The surge or cutting wave behind the boat was, however, comparatively slight, and, except at the curves, would not have caused much injury to the canal banks. The horse was very much exhausted when he got to Paisley, though by no means so exhausted as he was about the middle of the journey, having sensibly recovered after the first four or five miles.

"Two post horses were hired there; and lighter towing lines being attached to the boat, it started again, on its return to Glasgow, with twenty-four persons on board, four of whom were boys, and arrrived at Glasgow, a distance of seven miles, in forty-five minutes. The greatest speed attained, during the journey, was two miles in eleven minutes. During this voyage the surge behind was entirely got quit of, even at the curves, where it was reduced to nothing; and there was no front wave, except at the bridges. It appeared only at the bridges, and just as the boat was about to enter under the bridge, and gradually disappeared as the stern of the boat cleared the bridge. *The quicker the boat went, the more entire was the disappearance of all wave and surge,* except where the water escaped in the centre of the canal, and met in two very noisy and rapid currents from each side of the boat at the rudder. This noise and rush of water was so great behind as to induce persons on board to look round expecting to see a great wave or surge on the banks of the canal, but on the banks there was hardly a ripple. The two rapid, noisy currents seemed to be completely spent and exhausted by the shock of their concourse behind the boat. Here, therefore, there was no room to doubt of the correctness of the reports of the Forth and Clyde Canal experiments. It was not merely to be said, that the greater the speed the less surge or wave, but it was demonstrated, that, *at a high rate of speed, surge and wave were done away with altogether.* Unluckily, there was no dyanometer attached to the rope, so as to ascertain whether, contrary to all theory, the strain or pull was not equally with the wave, and the tugging labour of the two horses lessened instead of increased, by the accelerated rate at which they drew the boat. There can be no doubt, however, that with one trained horse, properly attached, the distance could be done in a period under forty minutes. Contrary to expectation, Mr. Wood's boat was quite steady in the water, and by no means crank. It may be proper to mention that the Ardrossan Canal is throughout very narrow; at the bridges, and many other places, it is only nine

feet broad. It has a great number of turns, and many of them very sudden."

RESULTS OF SOME EXPERIMENTS ON THE ACTUAL FORCE OF DRAUGHT OF CARRIAGES UPON COMMON ROADS.

By B. Bevan, Esq.

(To the Editors of the Philosophical Magazine and Annals.)

THE actual *force of draught* of carriages upon common roads has become a subject of interest and importance, as it relates to the principles of conveyance by rail-roads, and more so as it demonstrates the importance of attention to the surface of the road. I therefore take the liberty of sending you the results of some experiments of mine on that subject, conducted with considerable care in August, 1824.

These experiments were all made, or reduced to roads perfectly level or horizontal, to separate the mechanical force due to the inclination of the hill or plane from the force necessary to overcome the friction of the carriage in its ordinary state as affected by the condition of the road; and by way of rendering them comparable with other experiments which have been or may yet be made on this subject, I have considered the gross load of the wagon and burden to be divided into 1,000 parts.

Description of Road.	*Force of Draught.*
Loose sandy road	222, 240, 165, 163, 166, 190, 240, 215, 240
	Mean 204 or 1-5th.
Turnpike road new gravelled	121, 130, 180
	Mean 143 or 1-7th.
Ordinary bye-road	91, 121
	Mean 106 nearly 1-9½.
Hard compact loam	61, 36, 61
	Mean 53 nearly 1-19th.
Dry hard turf	40, 40
	Mean 40 or 1-25th.
Turnpike road with a little dirt	30
——— more dirt	39
	Mean 34½ or 1-29th.
Turnpike road free from dirt	30, 30, 31
	Mean 30⅓ or 1-33rd.

From which it appears that *five* horses will draw with equal ease the same load upon a good hard turnpike road, as *thirty-three* horses can do upon loose sand! Or, if we assume the

value of draught, upon a well-formed road, in good condition, at sixpence per ton per mile, the equivalent price of draught will be,

	s.	d.
Upon hard turf	0	$7\frac{1}{4}$
hard loam	0	$9\frac{1}{2}$
ordinary by-road	1	7
newly gravelled road	2	2
loose sandy road	3	1

I am, gentlemen, yours truly,

Leighton Bussard, 13th March, 1830. B. BEVAN.

SHIPS AT SEA.

On February 26, at the Royal Institution, Mr. Watson gave an account of the means of preventing ships from foundering at sea. He illustrated his proposed method by the use of numerous models, and by experimental illustrations of the actual floatage or buoyant power of certain bulks of different kinds of wood used in ship-building. The principle which he adopts, and upon which every thing rests, is the buoyant power of tight copper tubes filled with air and built in with the vessel in the various convenient situations afforded in the lower part, as between the timbers, under the decks, &c. He illustrated his calculations by a model of an eighty-gun ship, and then drew the results as to expense, saving, &c. upon the same scale. His conclusion was, that the saving of property and lives would be very great, and the adaptation very practicable.

MUSICAL SOUND.

On March 5, at the Royal Institution, Mr. Faraday lectured on the transmission of musical sounds through linear conductors, and their ultimate reciprocation. It was delivered by Mr. Faraday, but he informed the members that the matter, experiments, and new facts which he should have to bring forward, were altogether Mr. Wheatstone's. The general nature of musical sound was first distinguished from noise, and then its transmission through different bodies illustrated. The views gradually developed by Bacon, Hooke, and others, down to the present time, were detailed, by which ultimately we had gained much accurate knowledge of the conduction of sound through solid conductors.

After this the nature of the sounding-boards of instruments was entered upon, and it was shown how the vibrations of a string, rod, or other almost inaudible phonic could be rendered strong and powerful when transmitted to planes extended in the direction perpendicular to the course of the vibrations, and also how far the inclosed volumes of air between the tablets of an instrument still further exalted the sound by resonance, and rendered it evident.

The conduction of sound by linear bodies and its ultimate reciprocation was then taken up, and numerous experimental illustrations were adduced. A tuning-fork vibrating on the roof of the lecture-room had its vibration communicated inaudibly through forty feet or more of deal rod to the floor below, and then the sound developed by reciprocation; so that those close even to the tuning-fork referred the origin of the sound to the lower end of the apparatus. Conducting rods and wires were passed through the floor of the lecture-room into a repository below, and the sounds of a piano transmitted from below to a harp above, whilst the sounds of the harp in the lecture-room were transmitted to the piano-forte below. The music of stringed instruments, wind instruments, and even of the orchestrina or symphonium was equally well transmitted, being rendered evident and audible only at the place where, by pre-arrangement, their reciprocation had been provided for. Mr. Wheatstone intends shortly to arrange the new matter which he has been able to add to this branch of acoustical science in a separate form. Parts of it are already before the public in the Annals of Philosophy, and Quarterly Journal of Science.*

IMPORTANT EXPERIMENTS.

We have received the following account of the experiments made with the new marine boiler on Messrs. Braithwaite and Ericsson's construction. It is a low pressure boiler; and, from these experiments, it is evident that the following important advantages will arise to steam navigation by the introduction of this principle:—1. The total absence of all smoke; 2. The dispensing with the chimney; 3. A saving of at least 120 per cent. in the cost of fuel, and 30 per cent. in the space to stow it; 4. A saving of about 400 per cent. in the space occupied by the boilers. The same principle is now applying, by Messrs. Braithwaite and Ericsson, to the new locomotive engines constructing for the Liverpool and Manchester railway, which are to be delivered at Midsummer; and a similar combination of vast power, in a small space, with a great saving of fuel, will be applied to them.

Memoranda relative to the Experiments made at Mr. Laird's works at North Birkenhead, with the new Low Pressure Boiler, on the exhausting principle of Messrs. Braithwaite and Ericsson, by Alexander Nimmo, C. E. Dublin, and Charles B. Vignoles, C. E. London.—The exhausting apparatus consisted of a fan-wheel, with broad radial leaves, revolving within a close box or chamber, placed a little apart from the boiler, but connected with it by a passage leading from the flues traversing the boiler; a short tube above the exhausting chamber passed out to the atmosphere. The furnace was attached to and placed at the end

* See also Arcana of Science for 1830.

of the boiler, opposite to the exhausting apparatus; the latter being put to work, drew through all the turns of the boiler the hot air from the fire, which passed over the throat of the furnace through the bridge flue, and then successively through the other five turns of the flue arranged through the boiler; and finally was drawn through the exhausting chamber and passed into the atmosphere. The heat, which in the furnace was extremely intense, was absorbed by the water in the boiler as the air rushed through the flues, and, when passing up the tube or funnel from the exhausting chamber, was so far cooled that the hand or arm might be placed with impunity down the tube; the temperature probably not exceeding 180° of Fahrenheit. Not the slightest smoke was perceptible. The following are the principal dimensions measured:

	Ft. In.		Ft. In.	
Furnace	2 0 deep	Ash Pit	1 0 deep	The openings of the fire
	2 6 long		2 6 long	bear equal to about half
	2 6 wide		2 6 wide	the area of the bottom.

	Ft. In.			Ft. In.
Exhausting Chamber.	2 6 high	Outside Dimensions	Diameter of Exhausting Wheel	3 0
	3 6 wide		Breadth of the same ..	0 10
	3 6 long			

Bridge flue or throat from the furnace 2 feet 6 inches broad, 4 inch wide, 2 feet deep, 5-16th inch iron plate.

First turn of the flue 4 inches wide, 2 feet deep; 2nd, 3rd, 4th, and 5th turns, 3 in. wide, 2 ft. deep } ¼th in. iron plates.

Whole length of the flues through the boiler ...... 45 feet.

Superficial area of the heating surface .... 247 square feet.

The contents of the water in the boiler when filled were from .... 85 to 90 cubic feet.

The superficial area of the evaporating surface in the boiler, 33 square ft.

The proportion of the heating to the evaporating surface nearly 7½ to 1.

	Ft. In.		
Steam Chamber	3 0 wide	containing about	65 cubic feet.
	4 10 average depth		
	4 6 long		

Diameter of the safety valve nearly 5 inches, being 19 square inch area, which was loaded for a pressure on the square inch of 4 lb. Giving 76 for the load.

Of this, 66 lb. of iron were placed in the boiler, and 10 lb. allowed as the weight of the valve, rod, hook, handle, &c. The water used was the salt water from Wallasey Pool, and filled into a large iron tank, the area of the surface of which measured 32½ superficial feet. The boiler was placed under an open shed; the day was very cold, with thick rain. No engine being attached to the boiler, the exhausting apparatus was worked by a wheel and band from Mr. Laird's turning engine. The velocity of the circle of percussion of the leaves of the exhausting wheel was determined to be about 77 feet per second, or upwards of 52 miles an hour. Mr. Laird's engine is stated to be a four-horse

power. No determinate measurement was made, but the engineers present computed that the power applied to turn the exhausting wheel was equal to that of two horses. The fire being lighted, the steam was got up to 4 lb. pressure in 45 minutes, with a consumption of 2½ cwt. of coke. The expenditure at first was 8 lb. per minute, and gradually decreased to 5 lb., averaging about 6¼ lb. per minute for getting up the steam. The steam began to rise in 27 minutes, after which the consumption of coke was little more than 5 lb. per minute; and at this period there would have been a sufficient supply of steam to work the cylinders of an engine. The coke employed was gas-coke of very bad quality, of which 3½ cubic feet weighed 105 lbs., giving 30 lbs. for the weight of a cubic foot, or 3,000 lbs. as the weight of 100 cubic feet. The same weight of St. Helen's coal (that principally used in steam-boats) measures 63 cubic feet. The cost of the coke used was 8*s.* 6*d.* per ton, delivered in Liverpool; the cost of smithy coke being 25*s.* per ton, of which 3½ cubic feet weigh 115 lbs., giving very nearly 33 lbs. for the weight of a cubic foot. When the steam was up, the water in the thick glass gauge attached to the boiler standing at 7½ inches, the two men stationed for the purpose began to pump, a fresh supply of weighed fuel was placed on the floor, and the following observations were made:—At 3h. 32m. began to pump; at 3h. 54m. 16 cubic feet of water were evaporated; at 4h. 12m. 27 cubic feet of water were evaporated; at 4h. 19m. 38 cubic feet of water were evaporated, and 2 cwt. of coke consumed: at 4h. 32m. 41⅓ cubic feet of water were evaporated, with a consumption of 252 lbs. of coke. From which it appears, that only 6 lbs. of coke per cubic foot of water per hour were consumed; and the evaporation of a cubic foot of water per hour being generally considered the measure of a horse power, the conclusion is, that the boiler was a forty-horse boiler, and the quantity of fuel requisite to work it is 2¼ cwt. per hour, the expense of which is 12¾*d.*; and as the consumption diminishes after the first hour, the expense of fuel will probably not exceed 1*s.* per hour for the forty-horse boiler. (Signed) ALEXANDER NIMMO, C.E., CHARLES B. VIGNOLES, C.E.—*Waterloo Hotel, Liverpool, 29th May,* 1830.*

SPECIFIC HEAT OF ELASTIC FLUIDS.

THIS subject, which has been under investigation at various times by MM. De la Roche and Berard, Haycraft, De la Rive and Marcet, has been taken up by M. Dulong, who has applied to it a new method of investigation dependent upon the velocity of sound in the different gases. La Place showed that the velocity of the sound in air or other elastic media was importantly influenced and increased above the expected velocity by the heat

* Jameson's Journ.

evolved, as the vibrations producing sound passed through the air; and M. Dulong, by examining and comparing the sounds produced by different gases, has endeavoured to ascertain whether this element is the same in all of them. He arrives at this general law, remarkable for its simplicity: 1. That equal volumes of all elastic fluids taken at the same temperature and pressure, when compressed or expanded by a fraction of their volume, disengage or absorb the same *absolute quantity of heat*. 2. That the variations of *temperature* which result, are in the inverse ratio of the specific heat of a *constant volume*.*

IMPROVEMENT IN CORNWALL STEAM-ENGINES.

By Davies Gilbert, Esq., President of the Royal Society.

THE practical adaptation of the steam-engine to mechanical purposes is considered by Mr. Gilbert as due to Mr. Newcomen, whose inquiries were introduced into Cornwall very early in the last century, and soon superseded the rude machinery which had, till then, been employed for raising water from mines by the labour of men and of horses. The terms of Mr. Watt's patent in 1769, which secured to him until the year 1800, the receipts of one-third of all the savings in fuel, resulting from the adoption of his improvements in the construction of the engine, rendered it necessary to institute an accurate comparison between the efficiency of his with former engines. A copy of the report drawn up on this occasion, in October 1778, is given in the paper; but as the dynamic unit of one pound avoirdupois, raised through a height of one foot, by the consumption of one bushel of coal, had not yet been established as the measure of efficiency, Mr. Gilbert, proceeding upon the data furnished by that report, calculates that the duty performed by Watt's engine on that occasion was 7,037,800. In the year 1793 an account was taken of the work performed by seventeen engines on Mr. Watt's construction, then working in Cornwall. Their average duty was 19,569,000, which exceeds the former performances of the atmospheric engines in the standard experiment in the proportion of 2·78 to 1. Some years afterwards, disputes having arisen as to the real performance of Mr. Watt's engines, the matter was referred to five arbiters, of whom Mr. Gilbert was one; and their report, dated in May 1798, is given, as far as relates to the duties of the engines. The general average of twenty-three engines was 17,671,000. Since that period, so great have been the improvements, in the economy of fuel, and other parts of the machinery, that in December 1829, the duty of the best engine, with a cylinder of eighty inches, was 75,628,000, exceeding the duty performed in 1795 in the proportion of 3·865 to 1, and that of the atmospheric engine of 1778 in the proportion of 10·75 to 1.

* Annales de Chimie.

The remainder of the paper relates to the friction in machinery, and the different modes of obviating its effects. With a view of reducing the amount of friction, Mr. Gilbert is led to consider what are the most proper forms for the teeth and cogs of wheels, and through what intermediate steps a given increase of angular velocity may be most advantageously communicated. Equability of velocity is obtained, though at the expense of some degree of sliding friction, when the outline of the teeth of the wheels are involutes of circles. Friction, on the other hand, is wholly prevented when their form is logarithmetic spiral; but the angular velocities will then be variable. Hence these two advantages are incompatible with one another; but, on the whole, Mr. Gilbert gives the preference to the involute, which produces an equability of angular motion. The most advantageous mode of increasing velocity by a series of wheels, is to adjust them so that the multiplication of velocity shall proceed in a geometrical progression.*

ON POLISHING METALS.

Before proceeding to polish metals, the workmen commence by preparing the surfaces of the articles; that is to say, it is of importance to remove all the marks left by the file, the turning tool, the scraper, &c. in order to render the surfaces uniform.

This preparation is effected on those metals which are not very hard, by means of pumice-stone, either used in substance, or reduced to powder, and water; and, when in powder, applied upon felt, or upon slips of soft wood, covered with buffalo or chamois skin, if the surfaces be flat; or with pieces of soft wood, properly shaped, so as to penetrate into the hollows, and act upon the raised parts. When the first coarse marks are thus removed, they then proceed to remove those left by the pumice-stone. In order to this, they employ finely powdered pumice-stone, which they grind up with olive-oil, and employ it upon felt, or upon small pieces of soft wood, such as that of the willow or sallow. It is important, in these manipulations, to observe an important rule, which is never to proceed from one operation to another, before previously washing the pieces of work well with soap and water, by means of a brush, in order entirely to remove the pumice stone, used with water, before employing it with oil, and likewise never to use those tools for succeeding operations, which had been used in preceding ones; each stage of the operation requiring particular tools, and which should be kept in closed boxes, in order to prevent the powders from being diffused or scattered about when not in use. Without taking these precautions, which must be particularly and minutely attended to, we should be liable to make fresh scratches instead of removing them.

* Philos. Mag.

After removing the marks left by the coarse pumice-stone and water, by means of finely grounded pumice-stone and oil; to know which, we should wash it with soap and water, and dry it well with a linen cloth; we must then examine it with a lens or magnifying-glass, to see whether any scratches yet remain; if not, we may proceed to the polishing. The softer metals are polished in different manners, according to their size and uses; the larger gold works are, however, generally burnished, but the smaller gold works in jewellery, &c. and those in brass for watch-work, are not burnished, but polished The following are the manipulations:—After having removed with oil-stone powder the marks of the file, &c. they smoothen them with blue and grey stones, and plenty of water: there are two kinds of these stones, the one soft and the other hard; the first is designated by Brongniart, under the name of Argillaceous Schistus, and is the kind in question; the second kind is named by the above mineralogist Schisto Coticule; this serves to sharpen tools upon. The pieces of watch-work are always smoothened in this manner, until all the marks disappear and which is known by washing them in the manner above-mentioned with soap and water.

They finally proceed to polishing, with the tripoli from Venice, which is preferable to any other sort and is either finely ground in water, or in olive-oil, according to the different cases, for pieces of gold work, or the larger kinds of jewellery articles, and until they perceive their surfaces are become perfectly brilliant; they then finish them with tripoli, reduced to an impalpable powder, and applied upon a very soft brush.

For polishing those pieces of watch-work which are not to be gilt; after smoothing them with grey or blue stone and water, they polish them with rotten-stone well washed over, and consequently very fine, ground up with olive-oil, and finish them with dry rotten-stone.

This rotten-stone is, according to M. Brongniart, a kind of very light tripoli, but finer and more friable than the other sorts. It is found in England, and is highly esteemed for polishing; it is of an ashy-grey tint, and occurs in thin layers, upon the compact carbonate of lime, near Bakewell, in Derbyshire. The polishing of steel is not executed in the same manner as in polishing the softer metals; the steel is not polished until it has been hardened, and the harder it is the more brilliant will be its polish.

The substances we have above indicated for polishing other metals, are not powerful enough to attack a substance so hard as this. We must employ emery, a substance too well known to need describing here; it is ground in oil before used.

The hardened steel is either polished flat, like glass, or cut into facets, like a diamond; consequently, the lapidary's mill is used. They commence by smoothing the work with rather

coarse emery, then with finer emery, and finish with the finest. The smoothing being perfected, they polish it with English rouge, tritoxide of iron, and oil, and finally finish it with putty of tin (peroxide of tin) and water; but if upon mills, or laps of zinc, then without the use of water. When the steel articles consist of raised and hollow work, they are smoothed and polished with the same substance; but the instruments are, as in the case of less harder metals, pieces of wood, properly shaped, and employed in the same manner.*

ENORMOUS QUANTITY OF IRON MANUFACTURED, AND OF COAL CONSUMED, IN WALES.

THE quantity of iron annually manufactured in Wales has been calculated at about 270,000 tons. Of this quantity a proportion of about three-fourths is made into bars, and one-fourth sold as pigs and castings. The quantity of coal required for its manufacture on the average of the whole, including that used by engines, workmen, &c., will be about 5½ tons for each ton of iron; the annual consumption of coal by the iron-works will therefore be about 1,500,000 tons. The quantity used in the smelting of copper-ore, imported from Cornwall, in the manufacture of tin-plate, forging of iron for various purposes, and for domestic uses, may be calculated at 350,000, which makes altogether the annual consumption of coal in Wales= 1,850,000 tons. The annual quantity of iron manufactured in Great Britain is 690,000 tons. From this statement it will be observed that the quantity of iron smelted in Wales is upwards of one-third of the total quantity made in Great Britain. The manufacture of the Welsh iron is in the hands of a few extensive capitalists, and is carried on with great spirit and attention to improvement. The principal works are in the town of Merthyr, and its immediate neighbourhood; and, as the greatest portion of metal produced is manufactured into bar-iron, a process which, in the refining, puddling, and cementing of the metal, necessarily requires a great number of furnaces, their appearance on approaching Merthyr, by night, from the hills with which it is surrounded, presents a scene which is probably without a parallel.†

TRANSPARENT WATCH.

A WATCH has been presented to the Academy of Sciences of Paris constructed of very peculiar materials, the parts being principally formed of rock crystal. It was made by M. Rebel-

* Technological Repository.

† Foster in the Transactions of the Natural History Society of Northumberland, Durham, and Newcastle.

lier, and is small in size. The internal works are all visible; the two teethed wheels, which carry the hands, are rock crystal; the other wheels are of metal, to prevent accidents from the breaking of the spring. All the screws are fixed in crystals, and all the axes turn in rubies. The escapement is of sapphire, the balance-wheel of rock crystal, and its spring of gold. The regularity of this watch, as a time-keeper, is attributed by the maker to the feeble expansion of the rock crystal in the balance-wheel, &c. The execution of the whole shows to what a state of perfection the art of cutting precious stones has been brought in our times.*

ADHESION OF METALS.

M. Prechtt states that the force with which two plates of the same metal adhere, is the same as that with which one of the plates will adhere to a plate of another metal, having a less adhesion, however, for metal of its own nature; thus, if two plates of copper will adhere with a force of 21 grains, then one of these copper plates will adhere to a similar plate of bismuth, zinc, tin, or lead, with the same force, although two plates of any of these metals will adhere with a less force.†

LOCOMOTIVE AIR ENGINES.

On January 29th, at the Royal Institution, Mr. Fordham gave an account of his proposed method of transferring the power of water-mills, stationary steam-engines, or other cheap first movers, to locomotive engines and carriages intended to travel on common turnpike roads. His proposal is to compress air by the power of these motors, and then employ its elastic power in propelling the carriages. The following is a brief prospectus of his plan.

The air will be condensed by the power of steam-engines, water-mills, or any other cheap prime mover. The air, when condensed, will be contained in strong but light iron vessels, called recipients; a certain number of these recipients, fixed in a frame, and opening into one common main pipe or tube will be called a reservoir. Each reservoir will contain a quantity of condensed air sufficient to propel a carriage of a certain weight, one stage of eight or ten miles. The carriage in its appearance, or external form, will resemble a steam-boat in miniature. The wheels will support, and also give motion to, the vehicle: the reservoir will be suspended beneath the axle; and the bottom of the frame should not be more than nine inches from the ground. The machinery will consist of two or more cylinders, with pistons, connecting rods, and the apparatus for communicating motion, which is commonly used in high-pressure steam-engines. The valves must be made to close at any part of the stroke, for it is

* Revue. Ency. † Bull. Univ.

necessary to let the air expand in the cylinders, and it will be advantageous to let the air pass from one cylinder to the other; working in each or all expansively; and permitting it to escape from the last into the external atmosphere. With these conditions in view, a carriage for conveying the mail may be made of the following weight:

	Cwts.	Qrs.	Lbs.
Reservoir, containing 68 cubic feet	13	1	0
Machinery - - - - - -	2	3	0
Carriage - - - - - - -	13	0	0
Condensed air - - - -	2	0	0
Engineer and guard - - -	3	0	0
4 Passengers, and bags - - -	8	0	0
	42	0	0

The velocity or rate of travelling of such a carriage as this, may be fourteen miles per hour; the expenditure of air on ten miles will not amount to 2,000 cubic feet; the reservoir will contain upwards of 3,000 cubic feet.

A carriage intended to convey passengers, and not the mail, may be made on the same plan, but the proportions of the several parts will be different.

	Cwts.	Qrs.	Lbs.
Reservoir, containing 140 cubic feet	26	2	0
Machinery - - - - - -	4	2	0
Carriage - - - - - - -	16	0	0
Condensed air - - - - -	4	0	0
Engineer and guard - - -	3	0	0
20 Passengers, with their luggage -	30	0	0
	84	0	0

The rate of travelling should be at the least ten miles per hour; the expenditure of air will be 4,000 cubic feet, the reservoir will contain 6,000 cubic feet. It should be observed, that in bad weather the reservoir may be charged with more air than the quantity above mentioned. The expense of compressing the air will vary with the cost of the power employed in condensing it, and the quality of the machinery; but, in general terms, it may be stated that the power of steam produced by the combustion of one bushel of coals will condense 2,000 cubic feet of air, under a pressure of 36 atmospheres, or of 36 times 15 lbs. per square inch.

To conclude; on roads of great traffic, the capital invested at present in horses and carriages will be sufficient to erect stationary engines and condensing machinery, and also to construct the locomotive carriages; and, in some cases, the capital required by the proposed plans will be less than that which is now employed.*

* Quart. Journ. of Science.

NEW HYGROSCOPE.

THIS instrument is the invention of M. Benout, and although he calls it a hygroscope, it still has the power to a certain degree of *measuring* moisture present in air. Its indications appear to be exceedingly delicate; its action depends upon the expansion and contraction of paper, when exposed to moisture and dryness; that used is what is known by the term *papier végétal*, which is exceedingly hygrometric, very thin and very homogenous. The principal piece in the instrument consists of an exceedingly thin metallic plate about 10 inches long, and 6-100 of an inch in width; it is formed into a helix, and the external part is covered with a plate of the paper above mentioned, of the same size, united to it by means of a cement unacted upon by moisture. When this spiral is in moist air, its external surface being hygrometric expands, whilst the inner does not, and a motion of torsion takes place, which may be rendered evident by a needle attached to the lower coil, and traversing over a graduated circle. The contrary motion occurs as the instrument becomes dry. The length of the spiral is conveniently made such as to allow a motion of the needle, in one revolution from 60° to 100° on Saussure's scale.

This instrument is liable to certain objections, amongst which are the following:—1. As the paper becomes moist, it expands, overcoming the elasticity of the metal, but ultimately it becomes so soft, that though it is becoming damper, the force of the metal overcomes the paper, and the needle returns towards dryness; this effect only happens near to extreme moisture, at 95° of Saussure's scale. 2. The elasticity of the metallic plate varying with the temperature, proves that changes in heat are sufficient, by influencing the quality, to produce motions in the needle. 3. The two parts of the spiral, the metal and the paper, being of unequal expansion by heat, the instrument acts like Breguet's thermometer. The effect of heat is the same with the increase of moisture, as to the motion of the needle; the effect of cold is the same as increased dryness.

The sensibility of the instrument is very great: an experiment like one of Saussure's was repeated with it; the instrument was put under the receiver of a good air-pump, and when stationary, rapid exhaustion was effected; in 6 or 7 seconds the needle had risen from 45.5 to 59; it then became stationary for a moment, and afterwards proceeded to indicate dryness with such rapidity, that in 12 seconds the needle had traversed the circle. The exhaustion being discontinued, and the air allowed to enter, it returned to the point from whence it parted in 8 seconds, giving a motion over 105° in less than half a minute.*

Recueil Industriel.

STEAM-BOAT EXPLOSION.

ANOTHER explosion of a steam-boat has recently taken place near New York, North America, on board a boat named "The United States," on her voyage to Newhaven, which was accompanied with the destruction of human life. The following particulars are collected from the American papers. The accident occurred off Blackwell's Island. The water and steam burst forth, accompanied with cinders, pieces of brick, iron, &c. in the direction towards the bow of the boat. It appeared from the evidence of the engineer and captain, that the boiler was, a minute or two previous to the accident, ascertained to be fully supplied with water, and that the steam was not in excess. "The United States was going at her usual speed with twelve and a half inches of steam, she could carry thirteen or fourteen inches, and the boiler is so fixed that the steam blows off itself at fourteen inches. The rupture took place in the lower part of the main flue, about ten feet back of the bridge wall. It closed up the flue nearly altogether. The rent is what has been heretofore termed a 'collapse of the flue.' The part torn up had been repaired about a week previous. There were four new sheets of iron put into the flue. The new sheets were torn away, but the rivets remained in the old sheets. There were no braces between the flue and the outer shell, through the whole length of the bottom of the boiler. The boiler is of iron, appears firm and strong, is of a cylindrical form, about twenty-two feet in length and eight feet in diameter, with what are denominated 'kidney flues,' forming one large cylindrical, and one small return flue. It has been in use nine years; it is of the low pressure kind.

"It is a singular coincidence, that in nearly all the accidents which have occurred in our waters, the ruptures have taken place in the same part of the boiler. In the explosions of the Constitution, the Chief Justice Marshall, the Legislator, the Bellona, and the Caroline, all low pressure boats, like the United States the rent was made in the lower part of the flue, which was raised upwards. In all these boilers no braces were in the bottom of the boiler. The Constitution had braces put in between the lower shell and the flue, and no accident occurred afterwards."*

ON M. GUINAND'S GLASS FOR TELESCOPES.

By M. Utzschneider.†

IT is stated in the *Bibliothèque Universelle*, (November, 1828, page 175,) that the nine-inch object glass, belonging to the Dorpat telescope, made by Utzschneider and Fraunhofer, came from the crucibles of M. Guinand.

* Reg. Arts, Dec. 1830.

† From Schumacher's *Astron. Nachrichten*, No. 163.—Translated in the Philosophical Magazine.

Several other journals have also repeated, from the Globe (French newspaper) of November, 1828, that MM. Thibeaudeau and Bontemps had, in concert with M. Guinand the son, re-discovered the secret of producing flint glass of any magnitude, highly favourable for optical purposes; a secret which they pretend has been lost since the death of Fraunhofer, and Guinand the father: and that amongst the pieces presented to the Academy of Sciences, there were some of fourteen inches diameter.

I do not wish to occupy the public attention about my own affairs; but I am nevertheless obliged, by the interest which is attached to this singular discovery, to state some particulars relative to the residence of M. Guinand in my glass-house at Benedictbeurn. I have already spoken of it in 1826, in my Life of Fraunhofer; but it is necessary to recur to it again, in order to refute the reports which are circulated injurious not only to my establishment, but also to the memory of Fraunhofer.

Before M. Pierre Louis Guinand entered my service, I made him communicate to me every thing he knew, up to that time, as to the art of making glass: I also obtained from him a description of the small castings made by him since 1775: and I was convinced that his efforts would not have been attended with any advantage either to science, or to his own interests. M. Guinand renewed unsuccessfully his attempts, but was not the less received by me. His efforts directed me in the path which he ought to have pursued to obtain his object; and I therefore resolved to continue to work with him, after a settled plan, and to take advantage of every moment of leisure I could spare from my public duties to assist at his castings.* We obtained some pieces of flint glass, with which we made object glasses for instruments forming in the manufactories of Reichenbach, Utzschneider and Liebherr. Our labours were only discontinued when I attended my public duties: I then charged M. Fraunhofer with the direction of the castings which were undertaken at my expense; and this excellent optician always gave me a written report of the experiments and castings that he had made.

M. Guinand announced to me, on December 6, 1823, that domestic affairs required his presence at Brennets; in fact, he left me some time after, and never returned again to Benedictbeurn.

The description of the castings of M. Guinand, written with his own hand, and still in my possession, proves, that, in 1805, he could not then make perfect flint glass; and that he would not have succeeded but for the experiments made with me at Benedictbeurn, and at my expense. Still the glass of the last casting, which was made at the commencement of the year 1814, was not equal in quality to that which Fraunhofer made at a later period.

The flint glass for the object glass of the Dorpat telescope was

not cast till four years after the departure of M. Guinand, in the thirty-third casting of December 18, 1817; as may be seen by M. Fraunhofer's journal: and it was I who furnished the principal materials for this and the thirty-second casting.

On the 11th of January, 1816, M. P. L. Guinand wrote to me that he was about to superintend an important glass manufactory; to which I replied that he ought so to do, and recommended him to undertake to instruct some one to make flint and crown glass. A short time afterwards (in a letter of February 10, 1816,) he again offered me his services, stating "I have recently obtained some knowledge about making glass, and have lately put it in practice by two small castings." But, M. Guinand, at that time, still did not know how to produce glass for optical purposes.

After the departure of M. Guinand, my friend Fraunhofer made several large and excellent castings which succeeded to our utmost wishes. Since his death, I have myself undertaken the continuation of the manufactory of glass destined for optical purposes; and I believe that I can guarantee its excellence. The object glasses recently constructed by my workmen, sufficiently well attest that the secret of making flint glass, of any size, for optical purposes, is not yet lost, as the Globe would have us believe. I assure you I shall be happy to see our neighbours follow us, or even surpass us, in an art which is so immediately connected with the interests of science. I shall take care, on my part, to continue the researches commenced by Fraunhofer on the theory of light, hoping that those who contribute thereto will receive the reward which they so justly deserve. *Suum cuique.*

UTZSCHNEIDER.

MICROSCOPES.

THE following is from Mr. Lister's paper on the compound achromatic microscope of Mr. W. Tulley; with some account of the present state of the microscope, and suggestions for its improvement on a new principle; and is communicated by Dr. Roget, Secretary of the Royal Society.

The principles on which the reflecting, and also the achromatic refracting telescope are constructed, have been recently applied with considerable success to the microscope, and have added much to the power of that instrument. The author speaks with much commendation of the peculiar construction adopted in Mr. Tulley's compound achromatic microscopes, consisting of a combination of object glasses of short focus and large aperture, the curvatures of which are such as very nearly to equalize the refractions produced by each. As the magnitude of the aperture, he observes, is valuable only in proportion to that of the pencil of light which it admits, the latter circumstance is that which chiefly claims attention; and as it is often erroneously estimated, a method is pointed out of ascertaining it with sufficient

exactness for every practical purpose. He then enters into a detailed description of the several parts of an instrument in his possession, constructed on the principles he recommends, referring to the drawings which accompany the paper. The magnifying power may be varied at pleasure, either by drawing out the tubes containing the eye-pieces, or by substituting an eye-glass of different power or differently combined; and by these changes an uninterrupted range of amplification is obtained from thirty-five to 800 diameters. No sensible loss as to distinctness is observable, whether the effect is produced by changing the eye-piece or by varying the length of the tubes. The construction of the instrument admits of the utmost variation of magnifying power, without the risk of losing sight of the object viewed; and every part which relates to the illumination being wholly detached from the stage, ample opportunity is afforded of rapidly moving the objects, and bringing into view a succession of them, while the light remains the same. Minute directions are given for the employment of the instrument, and its application to various purposes; and great stress is laid on the importance of a skilful management of the light. In stating the results of his experience on this subject, the author takes occasion to advert to some of the sources of fallacy, by which incautious observers with the microscope have so often been greatly misled. When a pencil of rays proceeding from an indefinitely small bright portion of an object is brought to a focus by the most perfect object glass, the image thus formed is in reality not a point, but a small circle, and will always appear as such, if the eye-glass of the microscope be sufficiently powerful. These circles have a considerable analogy to the spacious discs of stars viewed through telescopes. Like the latter they, become much enlarged by diminishing the aperture of the object glass; and they are also enlarged by increasing the intensity of the illumination. The overlapping of contiguous circles of diffusion has given rise to many fallacious appearances, (such as the spottiness which some surfaces assume,) which have been mistaken for globules. This optical illusion has been the basis of some ingenious but visionary speculations on the intimate structure of organic matter. The appearance, in certain directions of the light, of lines on the surface of an object where they do not really exist, may be traced to a similar cause.

The author proceeds to describe the method he uses for measuring the dimensions of the objects viewed; and notices different test-objects with reference to their affording the means of judging of the powers of the instrument. He next enters into a review of the comparative merits of various microscopes constructed by Cuthbert and Dollond in this country, and by Chevalier, Selligue, Amici, Utzschneider, and Fraunhofer, on the continent.

The concluding part of the paper is occupied by the develope-

ment of a principle, from the application of which to the construction of the microscope, the author expects that a still greater extension of its powers will, ere long, be obtained. He remarks, that the circumstance which limits the magnitude of the pencil, admissible with high powers by a single achromatic object-glass, is, that the correction for spherical aberration by the concave lens is proportionably greater for the rays that are remote from the centre, than for the central rays. The degree of confusion in the image hence arising, is, in similar glasses, inversely as the square of their focal lengths. It increases very rapidly with a small enlargement of the aperture, but may be rendered much less considerable by distributing the refractions equally among a greater number of lenses of smaller curvature. Hence the advantage obtained by certain combinations. The experiments made by the author have established the fact, that in general an achromatic object-glass, of which the inner surfaces are in contact, will have on one side of it two aplanatic foci in its axis, for the rays proceeding from which, it will be truly corrected, with a moderate operation; that for those proceeding from any part of the interval between these two points, the spherical aberration will be over-corrected; and that for rays beyond these limits, it will be under-corrected. Methods are pointed out for ascertaining the situation of these aplanatic foci. The principle here explained furnishes the means of destroying both kinds of aberration in a large focal pencil, and of thus surmounting what has hitherto been a chief obstacle to the perfection of the microscope.*

GENERAL STATE OF LEARNED SOCIETIES IN ENGLAND.

From Mr. Babbage's Observations on "The Decline of Science."

THE progress of knowledge having convinced the world that the system of the division of labour and of co-operation, was as applicable to science, as it had been found available for the improvement of manufactures; the want of competition in science produced effects similar to those which the same cause gives birth to in the arts. The cultivators of botany were the first to feel that the range of knowledge embraced by the Royal Society was too comprehensive to admit of sufficient attention to their favourite subject, and they established the Linnean Society. After many years, a new science arose, and the Geological Society was produced. At another and more recent epoch, the friends of astronomy, urged by the wants of their science, united to establish the Astronomical Society. Each of these bodies found, that the attention devoted to their science by the parent establishment was insufficient for their wants, and each in succession experienced from the Royal Society the most determined opposition.

* Philos. Mag.

Instituted by the most enlightened philosophers, solely for the promotion of the natural sciences, that learned body justly conceived that nothing could be more likely to render these young institutions permanently successful, than discouragement and opposition at their commencement. Finding their first attempts so eminently successful, they redoubled the severity of their persecution, and the result was commensurate with their exertions, and surpassed even their wildest anticipations. The Astronomical Society became in six years known and respected throughout Europe, not from the halo of reputation which the glory of its vigorous youth had thrown around the weakness of its declining years; but from the sterling merit of "its unpretending deeds, from the sympathy it claimed and received from every practical astronomer, whose labours it relieved, and whose calculations it lightened."

But the system which worked so well is now changed, and the Zoological and Medico-Botanical Societies were established without opposition: perhaps, indeed, the total failure of the latter society is the best proof of the wisdom which guided the councils of the royal. At present, the various societies exist with no feelings of rivalry or hostility, each pursuing its separate objects, and all uniting in deploring with filial regret, the second childhood of their common parent, and the evil councils by which that sad event has been anticipated.

It is the custom to attach certain letters to the names of those who belong to different societies, and these marks of ownership are by many considered the only valuable part of their purchase on entry. The following is a list of some of these societies. The second column gives the ready-money prices of the tail-pieces indicated in the third.

SOCIETIES.	Fees on Admission, including Composition for annual Payments. £.	s.	d.	Appended Letters.
Royal Society	50	0	0	F.R.S.
Royal Society of Edinburgh	25	4	0*	F.R.S.E.
Royal Academy of Dublin	26	5	0	M.R.I.A.
Royal Society of Literature	36	15	0	F.R.S. Lit.
Antiquarian	50	8	0	F.A.S.
Linnean	25	0	0	F.L.S.
Geological	34	13	0	F.G.S.
Astronomical	25	4	0	M.A.S.
Zoological	26	5	0	F.Z.S.
Royal Institution	50	0	0	M.R.I.
Royal Asiatic	31	10	0	F.R.A.S.
Horticultural	48	6	0	F.H.S.
Medico-Botanical	21	0	0	F.M.B.S.

* The Royal Society of Edinburgh now requires, for composition in

Thus, those who are ambitious of scientific distinction, may, *according to their fancy, render their name a kind of comet, carrying with it a tail of upwards of forty letters, at the average cost of 10l. 9s. 9¾d* per letter.

Perhaps the reader will remark, that science cannot be declining in a country which supports so many institutions for its cultivation. It is indeed creditable to us, that the greater part of these societies are maintained by the voluntary contributions of their members. But, unless the inquiries which have recently taken place in some of them should rectify the *system of management* by which several have been oppressed, it is not difficult to predict that their duration will be short. Full *publicity*, *printed statements* of *accounts*, and occasional *discussions* and inquiries at *general meetings*, are the only safe-guards; and a due degree of *vigilance* should be exercised on those who *discourage* these principles.

On the next five societies in the list, I shall offer no remarks. Of the Geological, I shall say a few words. It possesses all the freshness, the vigour, and the ardour of youth in the pursuit of a youthful science, and has succeeded in a most difficult experiment, that of having an oral discussion on the subject of each paper read at its meetings. To say of these discussions, that they are very entertaining, is the least part of the praise which is due to them. They are generally very instructive, and sometimes bring together isolated facts in the science which, though insignificant when separate, mutually illustrate each other, and ultimately lead to important conclusions. The continuance of these discussions evidently depends on the taste, the temper, and the good sense of the speakers. The things to be avoided are chiefly verbal criticisms—praise of each other beyond its reasonable limits, and contest for victory. This latter is, perhaps, the most important of the three, both for the interests of the society and of truth. With regard to the published volumes of their transactions, it may be remarked, that if members were in the habit of communicating their papers to the society in a more finished state, it would be attended with several advantages; amongst others, with that of lightening the heavy duties of the officers, which are perhaps more laborious in this society than in most others. To court publicity in their accounts and proceedings, and to endeavour to represent all the feelings of the society in the council, and to avoid permanent presidents, is a recommendation not peculiarly addressed to this society, but would contribute to the well-being of all.

Of the Astronomical Society, which, from the nature of its pursuits, could scarcely admit of the discussions similar to those of the Geological, I shall merely observe, that I know of no

lieu of annual contributions, a sum dependent on the value of the life of the member.

secret which has caused its great success, unless it be attention to the maxims which have just been stated.

On the Zoological Society, which affords much rational amusement to the public, a few hints may at present suffice. The largeness of its income is a frightful consideration. It is too tempting as the subject for jobs, and it is too fluctuating and uncertain in its amount, not to render embarrassment in the affairs of the society a circumstance likely to occur, without the greatest circumspection. It is most probable, from the very recent formation of this institution, that its officers and council are, at present, all that its best friends could wish; but it is still right to mention, that in such a society, it is essentially necessary to have men of business on the council, as well as persons possessing extensive knowledge of its pursuits. It is more dangerous in such a society than in any other, to pay compliments, by placing gentlemen on the council who have not the qualifications which are requisite; a frequent change in the members of the council is desirable, in order to find out who are the most regular attendants, and most qualified to conduct its business. Publicity in its accounts and proceedings is, from the magnitude of its funds, more essential to the Zoological than to any other society; and it is rather a fearful omen, that a check was attempted to be given to such inquiries at the last anniversary meeting. If it is to be a scientific body, the friends of science should not for an instant tolerate such attempts.

It frequently happens, that gentlemen take an active part in more than one scientific society: in that case, it may be useful to derive instruction as to their merits, by observing the success of their measures in other societies.

The Asiatic Society has, amongst other benefits, caused many valuable works to be translated, which could not have otherwise been published.

The Horticultural Society has been ridden almost to death, and is now rousing itself; but its constitution seems to have been somewhat impaired. There are hopes of its purgation, and ultimate restoration, notwithstanding a debt of 19,000*l.* which the committee of inquiry have ascertained to exist. This, after all, will not be without its advantage to science, if it puts a stop to *house-lists named by one or two persons*,—to making *complimentary* councillors,—and to auditing the accounts *without examining every item*, or to omitting even that form altogether.

The Medico-Botanical Society suddenly claimed the attention of the public; its pretensions were great—its assurance unbounded. It speedily became distinguished, not by its publications or discoveries, but by the number of princes it enrolled in its list. It is needless now to expose the extent of its short-lived quackery; but the evil deeds of that institution will long remain in the impression, they have contributed to confirm throughout Europe, of the character of our scientific establish-

ments. It would be at once a judicious and a dignified course, if those lovers of science who have been so grievously deceived in this society, were to enrol upon the latest page of its history its highest claim to public approbation, and, by signing its dissolution, offer the only atonement in their power to the insulted science of their country. As with a singular inversion of principle, the society contrived to render *expulsion** the highest *honour* it could confer; so it remains for it to exemplify, in *suicide*, the sublimest *virtue* of which it is capable.

Mr. Babbage also institutes a fair comparison between the National Encouragement of Science in England, and in France. We have only room for one of his illustrations:—

The estimation in which the public hold literary claims in France and England, was curiously illustrated by an incidental expression in the translation of the debates in the House of Lords, on the occasion of his Majesty's speech at the commencement of the session of 1830. The Gazette de France stated, that the address was moved by the Duc de Buccleugh, "*chef de la maison de Walter Scott.*" Had an English editor wished to particularize that nobleman, he would undoubtedly have employed the term *wealthy*, or some other of the epithets characteristic of that quality most esteemed amongst his countrymen.

WEDGEWOOD'S WARE.

THE greatest part of the earthenware now made in England is manufactured in a particular district of about ten miles in extent, well known by the name of the Staffordshire Potteries. Here earthenware has probably been made ever since the time of the Romans, (very evident remains of Roman potteries having been repeatedly discovered at a considerable depth below the present surface of the land;) but there does not appear to have been any ambition among the manufacturers to improve the art, or to produce any works of taste till the late Mr. Wedgewood engaged in the business. This most excellent man brought modellers from Italy, and from other parts of the continent, whom he engaged at high wages; and he also constantly employed a competent chemist in experiments, that nothing might be wanting which could conduce to extend the employment of earthenware throughout Europe, or that could in any way tend to give permanency to the staple manufacture of the country which had gaven him birth.† Mr. Wedgewood was the son of a potter in Staffordshire, and, from early youth, was employed in his

* They expelled from amongst them a gentleman, of whom it is but slight praise to say, that he is the first and most philosophical botanist of our own country, and who is admired abroad as he is respected at home. The circumstance which surprised the world was not his exit from, but his previous entrance into, that society.

† Parkes.

father's business. His education was very limited, and his patrimony small; but his mind was vigorous, and he soon manifested its superiority by the improvements which he introduced. By him was invented the Wedgewood or queen's-ware, which soon not only excluded the foreign manufacture from the market, but also supplied a large quantity for exportation, and gave a new spur to trade, extending the business far beyond all former example. As he acquired wealth he liberally expended it for the promotion of the arts, particularly in their application to his own business. The figures on his cameos and intaglios rivalled the productions of ancient Greece. By his means the district which he inhabited became the centre of a vast population, and a place of great wealth. He lived highly esteemed for his moral and intellectual qualities, the associate of men distinguished for genius and science, and died universally regretted.*

CARDING MACHINERY.

A SELF-ACTING machine was invented in England thirty years ago, for making wire cards for preparing wool and cotton; it bended and cut the wires, pricked holes in the leather, and inserted the bended teeth into these holes by one operation, without manual labour; a patent was taken for the invention by Messrs. Sharp and Whittemore in 1799. The machine was very ingenious, and was made to operate with rapidity; but the cards produced by it were too coarse and imperfect to be used with advantage in this country, where the art of card-making by hand had previously been brought to great perfection; the inventer, therefore, carried his machine to America, where coarse cards were more in requisition; and as our laws prohibited the exportation of any of our cards, the want of efficient card-makers in America rendered a self-acting machine of value there, although not very perfect in its operation: he succeeded in America so far as to carry on a trade, and by practice improved his machinery till it supplied the American demand very well.' A Mr. Dyer, who was at that time a merchant, became acquainted with the invention, and, thinking it had attained a state of perfection sufficient to be re-exported with advantage to England, he purchased the invention, and came over here to take out a patent when the original patent was nearly expired. Mr. Dyer ultimately began a manufactory at Manchester. When the cards manufactured by this machinery began to be sent out to the cotton and woollen mills, they were found still too coarse and imperfect for efficient use in England; and Mr. Dyer, though not originally a mechanician, set himself to study the subject until he was able to improve the machinery, and make saleable cards

* Jones's Address to the Franklin Institute.

by it. His first set of machines were all destroyed by fire at an early period of his settling in Manchester, and he lost much property; but, in the end, that circumstance ensured his success, because he made entirely new machines with many improvements that he had found out before the fire, but which could not have been applied with so much perfection by altering the original machines as in making new ones. He was obliged to take another patent for these improvements, and has had other patents since; and has established a considerable trade with great advantage.*

INSTANTANEOUS CONVEYANCE OF INTELLIGENCE.

The following is the " Prospectus of a new and curious Work, entitled a Developement of the Principle and Structure of the Auticatelephor; an Engine for the Instantaneous Conveyance of Intelligence to any Distance.—By the Inventer, T. W. C. Edwards, M.A., Lecturer on Experimental Philosophy and Chemistry."

" When it is considered," says Mr. Edwards, " that sound travels only 1,142 feet in a second, or about thirteen miles in a minute; and that the greatest velocity of a cannon-ball has never exceeded 4,000 feet per second; and that light, the fleetest of all things known, requires nearly seven minutes and a half to speed its way from the sun to the earth: few persons will believe it possible for man to have discovered a means of holding, at the distance of hundreds or even thousands of miles, and across the sea, converse with a friend, in the most perfect manner, and on any subject whatever, *instantaneously*, either by day or night.

" But, before the discovery of the properties of the loadstone, who could have believed that a needle should one day be the seaman's unerring guide, in all sorts of weather, and even the darkest night, to regions the most remote; and over seas that scarcely own a shore? Or who, before the invention of gunpowder, would have ever believed it possible for man to throw a sixty-four pound shot, or a shell weighing two hundred weight, to the distance of a mile and upwards in a few seconds? Or who, before the expansive force of steam was proved, could have believed that the vapour of water should ever give a rapid and continued motion to machinery which the combined strength of more than 100 horses could not stir? Or who, even half a century ago, would have deemed it possible for a human being to have ascended 10,000 feet into the air, and after soaring for an hour above the clouds, to have alighted, in perfect safety, fifty miles from the place of his ascent? Yet all these things have been done, and we no longer wonder at the effect. The public ought not, therefore, to look with too much severity upon a pro-

* Mr. Farey's Evidence on the Patent Laws.

ject, though apparently impracticable; but should rather encourage a spirit of laudable research.

"The inventer of the Auticatelephor undertakes to demonstrate clearly and briefly in the work which he has now in the press, the practicability and facility of transmitting from London, *instantaneously*, to an agent at Edinburgh, Dublin, Paris, Vienna, St. Petersburg, Constantinople, the Cape of Good Hope, Madras, Calcutta, &c. any question or message whatever; and of receiving back again at London, within the short space of one minute, an acknowledgment of the arrival of such question or message at the place intended; and a distinct answer to it in a few minutes.

"In principle this engine is altogether different from every kind of telegraph or semaphor, and requires neither intermediate station nor repetition. In its action it is totally unconnected with electricity, magnetism, galvanism, or any other subtle species of matter; and, although the communication from place to place is instantaneous, and capable of ringing a bell, firing a gun, or hoisting a flag, if required, yet this is not effected by the transit of any thing whatever *to* or *fro*—nor in the operation, is aught either audible or visible except to the persons communicating. It may be proper, however, to state, that a channel or way must previously be prepared, by sinking a series of rods of a peculiar description in the ground, or dropping them in the sea; but these, after the first cost, will remain good for ages to come, if substantial when laid down.

"It is right to apprize the public, that the inventer has explained (in confidence) the secret of his invention to several very scientific men, and as competent as any to judge of its merits: among others, the Vice-President of the Royal Society; the Professor of Natural Philosophy and Astronomy in the University of London; and the President of the Mechanics' Institution. He had previously made an offer on the subject to His Majesty's vernment, but without acceptance. His wish is, therefore, to place on record the era of the first application of a well-known principle, to a new and truly curious purpose, in a full developement of the means and method of communicating, *instantaneously*, with a friend at any distance whatever, from a few yards to 10,000 miles or upwards.

"On a small scale, the Auticatelephor cannot fail to be a source of rational recreation and amusement to noblemen or gentlemen, living at short distances from one another, and disposed to converse together through the medium of a truly elegant and novel invention."

It is a pity so notable a discovery should remain secret for want of adequate patronage, and we hope this notice may have some effect in increasing the list of subscribers. Mr. Edwards's address is "Homerton, Middlesex."*

* Editor of the Mechanics' Magazine.

PERKINS' STEAM-CANNON.

THE first experiments made with Perkins' steam-cannon at Vincennes, near Paris, have not been attended with very brilliant results; and it appears that the last have not been more fortunate. The enormous apparatus of which this machine is composed was placed at about forty paces distant from a wooden figure formed to represent the hull of a man-of-war; the projectiles thrown were about a four pound calibre, and remained fixed in the thickness of the wood: a four-pounder was afterwards fired off at the same distance, and the ball penetrated the figure. Other experiments may possibly give different results—but even allowing that the superiority of Perkins's cannon becomes perfectly established, the complication of the machinery and its enormous proportions will render its application to the arming of ships almost impossible.—*Journal de Commerce; United Service Journal*, January, 1830. It would seem then after all, that the Duke of Wellington was not so far wrong in pronouncing that Mr. Perkins' cannon would never answer.*

PREVENTION OF BACK-WATER.

A NEW work, published by Dr. Bigelow, of America, entitled *Elements of Technology*, contains the following remarks on the subject of overshot and breast-wheels:—"The pressure of the atmosphere occasions sometimes a serious obstruction to the motion of overshot-wheels, by causing a quantity of back-water to be lifted or sucked up, by the ascending inverted bucket when it first leaves the water. The difficulty is remedied by making a few small holes near the base of the bucket, and communicating with the next bucket. Through these the air will enter, and prevent the suction. It is true that when on the descending side these holes will allow the escape of some water; but as this water only flows from one bucket to the next, its effect is inconsiderable when compared with the advantage gained. Air, as Professor Robinson observes, will escape through the holes, about thirty times faster than water under the same pressure.

A NEW MODE OF FERRYING

HAS been recently patented in America, which might, we think, be introduced with advantage in many parts in this country. It is thus described:—A paddle-wheel like that of a steam-boat is to be placed on one side of a river, and is to be driven by the current. The shaft of this wheel carries two cog-wheels, which may alternately be made to take into a wallower, and turn it in opposite directions. On the same shaft with the wallower there are two drums, to each of which a rope is to be fastened, and

* Mech. Mag.

around each a portion is to be coiled; this rope is also to extend double across the river, and pass round a pulley on its bank. To the middle of this rope the ferry-boat is attached, when it may be sent over and return by a man who attends the wheel, and engages and disengages the wallower.*

THE NON-CONDUCTING POWER OF SAND

Is so great, that in eastern countries, when the surface of a bed of sand at mid-day is too hot to allow the hand to remain in contact with it, the temperature, at the depth of a few inches, is gratefully cool. During the celebrated siege of Gibraltar, the garrison turned their knowledge of this fuel to good account. The red-hot shot employed to destroy the Spanish floating-batteries was placed in wooden barrows on layers of sand, and thus carried from the furnaces to the batteries, without the wood once catching fire.†

DECLINATION OF THE NEEDLE.

The declination of the needle (its deviation from the meridian,) continues to diminish in 1829. It thus appears to be now decided that the retrograde movement which was begun to be observed in 1816, is not simply in accidental irregularity, but that the north pole of the needle, which from 1666 to 1816, had continually deviated from the meridian towards the west, has since approximated to it every year. From November, 1828, to November, 1829, the amount of the retrogradation has been 2¼ minutes. On Saturday, 30th October, 1829, at 2¾ hours after mid-day, M. Arrago found at the extremity of the garden of his observatory, far from any mass of iron which could effect his result, that the absolute western declination was 22° 12′ 5″.

Inclination of the Needle, (its dip below the horizon, first noticed by Robert Norman, a compass-maker at Ratcliffe.)—While the declination of the needle retraces its steps, the inclination continues to approach gradually to the horizontal. The mean of a number of observations made in the garden of the observatory on the 12th, 21st, 22nd, and 24th June, 1829, at 2¾ hours after mid-day, gives for the present amount of the dip, 67° 41′ 3″‡.

BALTIMORE AND OHIO RAIL-ROAD.

The length of this rail-road when completed will be 180 miles, and there will be but one summit in the whole line requiring stationary power. The estimated expense is 20,000 dollars per mile. The bridges are all built of stone. One over Gwynns-Falls consists of a single arch of 80 feet span, with an elevation of 58 feet to the top of the parapet, and 300 feet in length.

* Mech. Mag. † Ibid. ‡ M. Arrago—Annales de Chimie.

Another across the Patapsco has two arches of 55 feet span each, and two of 20 feet span: it rises 46 feet high, and is 375 feet long. The deepest cut will be 79 feet, and the highest embankment 57 feet. In one place the road has been carried through a solid mass of rock rising 58 feet above its surface.*

FIRE-EXTINGUISHING MACHINERY.

AMONG the many defects in the arrangements in London for the extinction of fire, one of the most inexcusable is the want of uniformity in the connecting screws of the hose of the different engines. The *Mechanics' Magazine*, published at Boston, in the United States, states, that not only is the hose used in the whole of the fire-department in that city made to connect by screws, but that the hose of the engines of the neighbouring towns of Roxbury, Charlestown, and Cambridge, is all made to fit that of Boston, whence "numberless advantages," in point of facility, are obtained. Verily! we of this ancient city have yet much to learn.†

PROTECTION OF STEAM-BOILERS FROM CORROSION.

M. VAN BECK, of Utrecht, states in a communication to the *Annales de Chimie*, that his experiments have led him to the conviction, that Sir Humphry Davy has committed a serious error in his Bakerian Lecture of 1826, in recommending the use of zinc or tin for the preservation of steam-boilers in which sea-water is used. He has found that tin, far from preserving iron, is, on the contrary, preserved by it; and concludes that "a piece of tin introduced into a boiler, instead of diminishing the danger of explosion by preserving the boiler, would powerfully contribute to its destruction."

CYLINDRICAL RAILWAY-CARRIAGE.

THE following account of a very novel and ingenious description of railway-carriage, invented by a Mr. P. Fleming, engineer, of New York, is given by Dr. Jones, the Superintendent of the Patent-office at Washington, in a recent Number of the *Journal of the Franklin Institute*.

The carriage is a cylindrical body, which may have an axis passing through it, or gudgeons affixed to, and projecting from, its ends, for the purpose of drawing it. The wheels are iron rims placed round the cylinder so as to encompass it like hoops; these stand at a proper distance from each other, to run upon the

* Mech. Mag. † Ibid.

rail; they are provided with flanches, or have their faces finished in any form suitable to the rail upon which they are to run. In the inside of the cylinder may be stowed boxes, barrels, bales, or other goods to be transported. When bars of iron, lumber, or other articles of considerable length have to be carried, the traction is performed in a different way; the carriage is then a hollow cylinder, not furnished with ends; the iron bars, boards, or plank, is passed entirely through it, and, of course, do not admit the employment of an axle, or gudgeons. In this case an endless rope is passed round the middle of the cylinder, which is furnished with double rows of pegs to form a groove, or checks, to retain the rope, or band in its proper place. This rope also passes over a pulley, which is attached to the horse, or other drawing power, so as to work like the large and small wheels of a lathe with their bands. Two, three, or more cylindrical carriages may be made to follow each other, when connected by bands in the same way.

Under this arrangement it is evident that whatever is carried must roll with the carriage, but in transporting some kinds of goods, and particularly in carrying persons, this would, to say the least of it, be very inconvenient. To obviate this objection, a second cylindrical body is placed inside of the first, and is made sufficiently small to revolve within it. This is suspended upon the axis, or gudgeons, and is weighted on one side, so that whilst the outer cylinder rolls upon the road, the inner one will not revolve with it. It is proposed sometimes to make this suspension by the agency of friction-wheels, so as to leave but little more friction than that which results from the rolling of the carriage. The patentee says—

"What I claim is the use of a cylinder, or other volume of revolution, on a rail-way, as a carriage, or vehicle for transportation.

"I also claim as my invention the use of the endless rope in the manner above described, for progressive motion. By means of this use of the cylinder and traction-rope, friction is saved, or avoided, to a greater degree than by any machine now known. The traction-rope may be employed separately from the cylindrical railway-carriage, in any other machine where similar progressive motion is required."

DAMASCUS SWORD-BLADES.

An imitation of the celebrated "Damascus blade," stated to be in no respect inferior to the Eastern original, has been fabricated in the dominions of both Austria and Prussia; and Professor Crivelli, the inventer of that which has been adopted in the Imperial army, has been liberal enough to give publicity to the means by which this formidable weapon may be manufactured. His detailed instructions will be found in a small work published

at Milan, and entitled, "Memoria sull' arte di Fabricare le Sciabole di Damasco;" of which the following epitome is extracted from the "Allgemeine Militär-Zeitung:"—A long flat piece of malleable steel, of about one inch and a half in breadth, and one-eighth in thickness, is to be first bound with iron-wire at intervals of one-third of an inch. The iron and steel to be then incorporated by melting, and repeated additions (10 to 20) of iron-wire made to the first portion, with which they must be firmly amalgamated. This compound material is then to be stretched and divided into shorter lengths, to which, by the usual process of melting, grinding, and tempering, any wished-for form may be given. By filing semicircular grooves into both sides of the blade, and again subjecting it to the hammer, a beautiful roset-shaped Damascus is obtained; the material can also be made to assume any other form. The infusion by means of which the figures are made visible, is the usual one of *aqua-fortis* and vinegar. The success of this method, and the excellence of the blades which have been constructed according to these directions, have by various trials been placed beyond all doubt. Professor Crivelli has had several sabre-blades prepared, under his own instruction, at Milan; similar experiments have, by the emperor's commands, been made at the Polytechnical Institution at Vienna; and, finally, the war-office has empowered Daniel Fischer, manufacturer of arms in that capital, to proceed with the fabrication on a large scale. These blades, which when made in large quantities, are but little dearer than those in common use, have been submitted to the severest tests, among which may be mentioned—cutting off hob-nails, which had been placed in great numbers behind each other; cuts upon a strong iron-plate, and many folds of cloth; horizontal blows upon a wooden table; and, finally, powerful bending on both sides. An idea of their extraordinary tenacity may be formed from the fact, that out of 210 blades that were examined by a military commission, and each of which was required to bear three cuts against iron, and two against a flat wooden table, not a single one snapped, or had its edge indented.

In Prussia this method of preparing sword-blades is stated to have been several years in practice, and to have been attended with equal success; among others, the manufactory of Schnackenberg, at Malapane, in Silesia, has been distinguished for the excellence of its imitation Damascus blades, which are neither in beauty nor durability inferior to those that have been fabricated at Milan.

FIRST STEAM COMMUNICATION WITH INDIA.*

It has for some time been a favourite object of Sir John Malcolm, Governor of Bombay, to establish a steam conveyance for

* From the United Service Journal.

despatches between that place and England, *via* the Red Sea, Suez, and Alexandria. A vessel called the *Hugh Lindsay*, of 400 tons burthen, with two engines of eighty-horse power each, was accordingly built for this purpose, at an expense of at least 40,000*l*. Though constructed upon such a costly scale, yet the unaccountable blunder was committed, of her not having capacity to carry more than six days' coal; when it is impossible she could reach the Arabian coast from India in less than eight or ten days. If every thing, however, had been properly managed, the mails might have reached Alexandria in twenty-three days, from thence to Malta would have occupied four days more: thence to Marseilles four days; thence to England five days; total from Bombay to London, under favourable circumstances; only thirty-six days! As it was, the *Hugh Lindsay*, commanded by Captain Wilson, sailed from Bombay, and reached Suez in thirty-three days, having lost twelve days in the ports of Aden, Mocha, Judda, and Cosseir, being detained in getting supplies of coal on board at those places. The letters sent by this vessel, after all, reached England in less time than any were ever received before from India. Col. Campbell was the only passenger by her, probably from want of room, as the cabin and every other place was occupied by the coal. She was so deep in the water on leaving Bombay, that she was *à fleur d'eau*, and her wheels could hardly revolve. The distances between the several places on her route are as follow:—

From Bombay to Aden,	1710 miles.
Aden to Mocha,	146
Mocha to Judda,	556
Judda to Cosseir,	430
Cosseir to Suez,	261
	3103

which, at twenty days' navigation, would give 155 miles a-day, or six miles and a fraction per hour. The despatches by steam, therefore, ought to go from Bombay to Cosseir in fifteen days; from thence to Alexandria by a dromedary *direct*, without stopping at Grand Cairo, seven days; Alexandria to Malta, four days, and so on as before mentioned, making in all from Bombay to England thirty-six days; or allowing for casualties, the mails might fairly be considered due in forty days.

The following letter has been received from an officer belonging to the *Hugh Lindsay*, detailing the operations of that vessel in this first attempt to establish a steam conveyance upon that sea, where the Lord opened a path for the Israelites of old, and where the proud Pharaoh and all his host so miserably perished. Surely, no subject can be more generally interesting, not only to the people of Great Britain, but to every nation of Europe:—

"Sir,—I have much pleasure in acquainting you with the arrival of

the *Hugh Lindsay* at Suez this day from Bombay, which place she left on the 20th of March. The passage has occupied more time than was expected, owing to the delay occasioned by receiving coal at Aden and Judda. At the former place we were detained six days, and at Judda five. We also touched at Mocha, which detained us a day. The present trip being an experiment, I was instructed, if time permitted, to visit you at Alexandria, for the purpose of communicating with you on the subject of steam-navigation in the Red Sea; but the season being now far advanced, it is necessary we should use the utmost despatch to ensure our return to Bombay, previous to the setting in of the south-west monsoon, for which reason we shall leave Suez as soon as we have received what coal there is. We touch at Cosseir to take what fuel is there also, and we are apprehensive we shall find scarcely enough on the Red Sea to take us to Bombay.

"The *Hugh Lindsay* is 411 tons burthen, and has two eighty-horse engines. By the builder's plan, she appears to have been intended to carry about six days' coal; but, in order to make the passage from Bombay to Aden, she was laden as deep as could be, and left with her transom in the water. Notwithstanding, on our arrival at Aden, after a passage of eleven days, we had only about six hours' coal remaining; which circumstance alone shows her unfit for the performance of the passage. Her being so deep, too, materially affected her speed. I met with greater detention in getting off coal at Aden and Judda than I had anticipated. Arrangements might be made to expedite the shipment of coal at those places, but I am now of opinion the fewer depots the better, and that if steamers were built of a class that would be propelled by engines whose consumption would not exceed nine tons of coal in the twenty-four hours, and which should carry conveniently fifteen days' coal at that rate of consumption, then the navigation of the Red Sea would be best carried on in two stages, one from Bombay to Aden, and from thence to Cosseir or Suez direct. I think, too, there is no necessity for proceeding up so far as Suez, as every object might be equally well attained by going to Cosseir only. As far as the passengers are concerned, the majority I should suppose would prefer being landed at that place, for the purpose of viewing the antiquities on the route from thence to Alexandria, and the arrival of despatches would be very little delayed, when we take into account the time occupied by a steamer, on going from the parallel of Cosseir to Suez, which, when north-west winds prevail, could not be done in less than two days and a half.

"I enclose a copy of the log of the *Hugh Lindsay*, from Bombay to Suez, conceiving it might possess some interest, as the journal of the first steam vessel which has ever navigated the Red Sea.

"*Hon. Company's Armed Steamer,* "I am, Sir, &c.
Hugh Lindsay, Suez, ——
April 22, 1830.

A PRESSURE MEASURE.

(*By B. Bevan, Esq.*)

To the practical mechanic, it is often desirable to ascertain the actual pressure produced by various machines and instruments; and it is often desirable to do this in spaces too small to admit the ordinary machines for measuring the force of pressure; such,

for instance, as powerful screw and hydraulic presses, and other machines of that nature. To the screw, and all its modifications, there always belongs a very considerable portion of friction at present not well determined:—the proportion of friction to the gross pressure in the hydraulic-press, has not been satisfactorily ascertained.

Having lately discovered a mode of measuring the actual pressure, in small spaces, with considerable accuracy, Mr. Bevan takes the opportunity of offering it to the public.

If we take a leaden bullet of any determinate diameter, and expose it to pressure between plates of harder metal, made to approach each other in a parallel position, the bullet will be compressed or flattened on two opposite sides in an equal degree; provided the lead is pure, the degree of compression will indicate the amount of pressure. With a graduated press of the lever kind, it will be easy to form a scale of pressure corresponding to the different degrees of compression, until the ball is reduced to a flat circular plate, of about one-fifth of an inch in thickness; and it will be found, that an ordinary bullet of about five-eighths of an inch diameter, will require a pressure of near 4,000 pounds to effect this degree of flattening. Suppose, therefore, we wish to measure an actual pressure, supposed to be nearly twenty tons, we have only occasion to place ten or twelve of these balls at a proper distance asunder, so as not to be in contact when expanded, and then to measure by good calipers, or other suitable means, the compression of each ball, either by its thickness or diameter, and afterwards add into one sum the particular pressure due to each ball, from the scale first made, by using the lever press before mentioned.

By this mode he has ascertained the amount of friction of an iron screw press, with rectangular threads, to be from three-fourths to four-fifths of the power applied, or the actual pressure has not exceeded four or five tons, when the calculated pressure, if there had been no friction, would have been twenty tons.

The larger the ball, the greater will be the pressure necessary to reduce it to a given thickness. An ordinary leaden shot, of one-eighth of an inch diameter, will require nearly 100 pounds to compress it to a flat plate.

By using a ball of five-eighths of an inch diameter, he has found the actual pressure of the common bench vice to be about two tons, when under the same force, if there had been no friction, the pressure would have been eight tons.

In the practical application of these balls, it will be convenient to make a small impression upon them with a hammer, before they are placed between the plates, to prevent them from rolling out of their proper position. This operation will not be found to interfere with the result, as it is the ultimate compression only that is sought, and which is not affected by that of a smaller degree before impressed. This property will also be found very

convenient; for, we may use the same substance several times, by taking care that each succeeding pressure exceeds that of the preceding, in the same manner as Wedgewood's pyrometers are used to measure any greater degree of heat than what they have been formerly exposed to.

It may be observed, that the application of these leaden balls to determine the actual pressure will not interfere with the regular operation of a press, as the articles under pressure may be in the press at the same time the balls are used, which of course must be placed between separate plates.*

MANUFACTURE OF PATENT LEAD SHOT.

(See the Plate.)

As some of our readers are probably unacquainted with the process of making the small lead shot used in fowling-pieces, we have considered a short paper on the subject as properly admissible into our columns. The process is, indeed, extremely simple and elegant; and being productive of an article that may be deemed *perfect* in its construction, it is well deserving of a more particular notice than we have ever met with in print.†

Previous to the invention of the patent process we are about to describe, the small shot were chiefly made by cutting sheet lead into little cubes, which were rounded by long continued friction against one another, produced by inclosing them in an iron barrel, which was made to rotate on its axis until the cubes were reduced into spheres. Another mode, considerably analagous to the present, was also in use, that of causing lead, and also lead combined with a small proportion of arsenic, to drop in a fluid state through a kind of sieve, (having perforations of a suitable size) into a vessel of water placed only a few inches beneath it. To prevent as much as possible the numerous imperfections resulting from this mode, a considerable degree of management and skill was required in the operator. The water, we understand, was covered with a thin film of oil, and the sieve with a stratum, an inch or more in depth, of the dross which form on the surface of the melted metal; this dross or scoriæ acting as a filter to separate the metal into minute portions, as the latter was poured over it in successive portions, by ladling it from a contiguous caldron. It will readily be conceived that shot thus produced, however skilful the operator, must have possessed great variety in size and form, and that but a small proportion of a casting were at all adapted to the use of the sportsman. At length, in 1782, one William Watt, a plumber and shot maker of the city of Bristol, DREAMED that he was engaged in his usual employment of casting shot in the church tower of St. Mary (in the aforesaid city), and that the produce of his labour, which fell from a very great ele-

* Phil. Mag. † Register of Arts.

Cash-register

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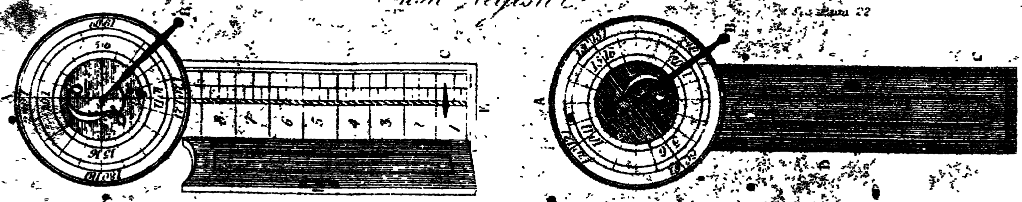

Vertical Section of a Patent small Lead Shot Manufactory

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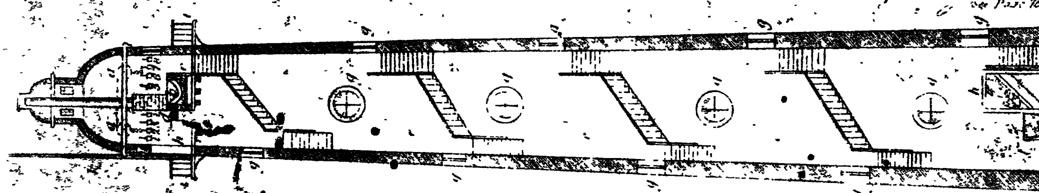


vation into the water, was of a very superior description. Reflecting upon this manufacture of his imagination, he became of opinion that a better process could not be contrived, and he was permitted to make a real trial of it in the identical site of his dream, the lofty tower of St. Mary; the experiment was as successful as the most ardent theorist could expect, the globules of metal becoming hard by the cooling influence of their descent through the air, so as not to be injured in their figure by subsequent concussion against the surface of the water into which they fell.—Mr. William Watt had besides made some improvement, it is supposed, in the preparation of the alloy used; but whether he dreamed this also we have not been informed; certain it is, that he took out a *patent* for his dream; and we are told upon good authority, that he afterwards *turned his lead into gold*, by selling his patent right for the sum of thirty-six thousand pounds. The specification of this patent is inserted in the third volume of *the Repertory of Arts.*

The kind of building used for the manufacture is represented in the engraving. It is a verticle section of the smallest shot tower belonging to Messrs. Walkers, Maltby, and Co. on the south bank of the Thames, London; its height is about 150 feet, affording a fall of about 130 feet for the shot. The alloy there used, consists, as mentioned in the specification, of 40lbs of arsenic to a ton of lead, is prepared and cast into pigs of about 1½ cwt. each, to be ready for use as required. By means of a suitable tackle and chain (a part only of which, to prevent confusion in the drawing, is brought into view at *a a*), ten of such pigs are drawn up through a trap door into the melting room at the top of the tower. Here the pigs are successively put into the caldron *b*, which is heated by a common furnace *c* beneath, having a brick flue and chimney, terminated by an iron funnel reaching to the top of the upper dome or lantern. When the alloy is melted and the scoriæ properly formed, a portion of the latter is ladled by the melter into a kind of square cullender *d*, supported in an iron frame fixed close to the furnace; this vessel is twelve or fourteen inches square, and about three inches deep; it has a handle like a frying pan, and its bottom is perforated with circular holes of a size suited to the shot about to be made. The quantity of dross required being determined by the experiment of making a few shot (which are not suffered to descend below the floor of the melting room); a man now ladles the fluid metal out of the caldron into the perforated vessel; in running through which it is somewhat detained and cooled in passing the scoriæ, which tends to separate it in small portions, where it collects underneath the cullender at every hole in small globules, which instantly drop, and are followed by other globules in such rapid succession as to appear at a little distance like a pouring rain of liquid silver. This metallic shower is represented in the drawing *e e e*, and falls into a large tub of water *f* placed underneath. From the great specific gravity of the shot they do not scatter in their descent, and the workmen cross the bottom floor of the tower, as their business requires, in perfect security.*

* A terrific accident however occurred when the identical iron pot *b* was raised to the top of the building. It had been drawn up to the top floor, when upon landing it the tackle by some mismanagement slipped,

The tower is quadrangular, and has four or five windows on each side, represented at *g g*; *h h* represents doorways, the upper one leading into an external gallery *i i*, which, as may be supposed, commands an extensive and highly interesting view of London and its suburbs; *k* a long flag staff, which extends beyond the limits of the paper. The stair-case from the bottom to the top of the tower is of iron, and of great stability; it is represented of course as dissected in the drawing, the foot plates are of cast iron, slightly fluted to prevent slipping; in which case the fall would, probably, not be severe, as the inclination is not steep, and there are square landing places at each corner of the quadrangle, as well as seats for the convenience of the weary, or the lazy ascendants and descendants.

The various sizes of the shot are distinguished by the manufacturers by the Nos. 1 to 12; the largest, No. 1, are called swan shot; the smallest, No. 12, dust shot; their diameter varying from 1-30th to 1-4th of an inch. The shot, when removed out of the tub, are dried by artificial heat, as they remain considerably wet, by the water being held between the little spheres by capillary attraction. To dry them they are scattered over a large heated iron plate, having a furnace beneath, on which they are well stirred about, and swept off as soon as dry. After this operation they present a dead white silvery appearance; they contain amongst them many (though but a small proportion) of imperfect shot, and the perfect differ somewhat in size; to separate these varieties from one another constitutes the next process. The dried shot are therefore taken to the sifters, who have each the management of a series of three or four sieves placed in a row, in a reciprocating iron frame, which derives its motion from a steam-engine. The movement is effected by a horizontal revolving shaft (near the ceiling of the room), having at the extremity a short crank, from which depends a rod, that is made to rise up and down; this vertical rod is attached at its lower extremity to a lever of the common bell-crank kind, which is connected to the frame containing the sieves, and therefore produces in the latter a reciprocating horizontal motion. Each sieve is also provided with a distinct frame, embracing its circumference, with a large joint on one side which connects it to the general frame. A quantity of the shot being thrown into the first sieve, that portion of them which is small enough passes through its meshes, the rest that are too large are then discharged into the next sieve, by *turning over* the first on its hinge joint, as a person would open and throw back the lid of a box. The advantage of this arrangement will be evident, when it is considered that the sieves, being constantly in rapid motion, it would be no easy matter to throw the shot from one into the other, were they separate without spilling: whereas by their connexion, the shot cannot be discharged otherwise than as intended. The attendant to the shifting apparatus has therefore only to supply the first sieve, and to discharge the contents from one to the other successively. The produce of the two first sieves is collected into separate bins, and as these contain many shot of imperfect *forms*, they are taken thence to another set of operators, who separate the bad from the good, by a process equally simple and effectual. Those which have not passed through the two first sieves of the series, are condemned as bad, and are remelted.

and the vessel, weighing 15 cwt. fell to the bottom of the tower, destroying the wooden floor, joists, and four massive cast iron beams, but happily without injuring any individual person.

A number of shallow quadrangular trays, the figure of which may be defined by the boundary line of a plane produced by the longitudinal section of the frustrum of a cone in the line of its axis, made of hard wood, and perfectly smooth at the bottom, are suspended from the ceiling by cords attached to the two corners of the widest ends of the trays, their other or narrowest ends resting upon the edges of a row of shot bins. Thus arranged, a boy, who manages two of these trays, throws upon each at the widest end (that nearest to him), a small measure full of shot; he then takes hold of the trays, and giving them a gentle vibrating motion laterally, and at the same time raising the ends a little to give them a slight inclination, the shot roll about tending from side to side, those that are perfectly spherical making their way quickly off the boards into the bin at the extremity; while those that are imperfect are detained by their comparatively sluggish movements, and being thus separated from the good, the trays are pushed forward about a foot, and their contents emptied into other bins placed beyond those containing the good shot as before mentioned. This operation is so effectual that it is difficult to pick an imperfect shot out of those that come to market. Four or five boys thus employed, with two trays to each, suffice for a manufactory of the kind we have described, which makes about five tons per day; the smallest shot require the utmost care and gentlest management of the inclined plane, therefore the eldest or steadiest hands are selected to operate upon them. The next and last part of the business, previous to the shot being bagged for the market, is to polish them; for this purpose a cast iron barrel, holding perhaps half a ton weight, is nearly filled with them, and a rotary movement communicated to it by the engine, which causes all the little spheres to rub against each other, and give them a black lustre, materially differing from their previous argentine complexion.

It is worthy of remark, that a curious effect is produced upon the interior of the cast iron barrel by the friction of the shot, that of wearing it into a regular series of grooves, so that a stranger would suppose the barrel had been cast with an internal fluting.

ON WINDING-UP CLOCKS, BY TAKING ADVANTAGE OF VARIOUS NATURAL CHANGES, AND ARTIFICIAL MOVEMENTS.*

A PATENT has been taken out by a Mr. Richard Ward, of Waterbury, New Haven county, Connecticut, dated November 5th, 1829, for the application of air to the above purpose. Air, like other bodies, is expanded by heat, and contracted by cold; it is proposed to use the expansion and contraction of this fluid, by natural changes of temperature, to keep a clock wound up.

An air-chest, or reservoir, of the capacity of four or five gallons, it is estimated by the patentee, will be sufficient for a time-piece with a striking movement. A tube is to pass from this air-chest, into a small gasometer, constructed with three concentric cylinders, precisely like those used for holding gases by the chemist. When the air expands in the chest, it is forced through the tube,

* From the Journal of the Franklin Institute, with additions by Mr. Gill.

and raises the middle cylinder of the gasometer; and when it contracts, that cylinder consequently falls. This cylinder is so suspended, that a cord or cat-gut, which passes over a pulley, turns a drum or barrel, and winds up the clock, whether ascending or descending. The particular modes of effecting this, described by the patentee, we shall not at present detail; those conversant with machinery will be at no loss in conceiving how this may be done.

That a delicately made time-piece may be wound up, by the expansion and contraction of fluids or solids, from natural changes of temperature, is an admitted fact. We have before made the following remarks upon the subject of the application of some of the moving objects in nature: "Some of these may be employed to keep clocks and other engines wound up, so that their action shall be continued. The contractions and expansions of a long bar of metal, from changes of temperature; the perpetual currents of rivers; the flux and reflux of the tide; regular and irregular winds, and draughts or currents of air; the hygrometric changes in certain substances, are of the kind intended; the employment of some of them is familiar, and the possibility of using the whole of them, as well as of some others which are not enumerated, will be evident to most of our readers."

On the employment of frequently recurring artificial movements, for similar purposes. By Mr. Gill,

We well remember, many years since, a clock, in Merlin's celebrated Mechanical Museum, near Hanover-square, which was wound up by the movements of a door in the house; and which was necessarily opened and shut many times a day. Our friend, Mr. J. J. Hawkins also proposed, long since, to avail himself of the vast quantity of power, and which might be usefully employed to work machinery, to be obtained from the constant passage backwards and forwards, of a number of persons over the yielding or springing-boards of a cellar door, in any of the great thoroughfares or alleys in this metropolis; and which downward pressure might easily be transferred to work machinery. We also recollect Mr. James Jones, engineer, whose improvements in screw-stocks and taps, we have lately given, employing the motion of a door in his father's premises, which was continually opened and shut throughout the day, to work a pump in the lower story or cellar of the house, which raised the water from the sink to the surface of the ground, whence it could easily run off, as there were no sewers to drain it below.

These suggestions may, no doubt, occasion our readers to avail themselves of many other sources of power, readily attainable; but of which, for want of being reminded thereof, they never yet profited.

We find a patent is lately obtained, by a Mr. Henry H. Western, of New York, for a tide-power, to work machinery, by the

rise and fall of the tides on the sea-coasts; he proposes to employ vessels or floats of great weight, and buoyancy, so that, in the instance of the fall of the tide by their weight, or their weights contained in them; and in the rise of the floats, by their floating, they may apply both ways a force proportionate to their weight and magnitude; and which, being connected to a lever, or beam, may be applied to draining or putting in operation machinery, and thereby saving animal, steam, or other powers, and possessing the very important advantage of contiguity to the marts of the manufactured articles.

The invention may be put in use by the affixing of a condemned or other hulk of a ship, of the required size. Or floats, with proportionate weights in them, properly affixed in one of the usual slips, or in any tide-water; and the beam or lever extended into a building projecting over it, or by the side of it, or on the side of streets fronting on the slips, and in other situations contiguous to the tide-water, the extent of the power to be regulated by the size and weight of the float.

Dr. Thomas P. Jones, the editor of the Journal of the Franklin Institute, remarks, that "the power to be obtained from the foregoing plan, supposing such an arrangement to be made as shall place it all under command, may readily be computed, its elements being the weight which rises and falls, and the distance of this rise and fall with every tide." This power the patentee claims to apply to machinery, "or any other required use." It has been repeatedly applied to use in raising sunken vessels, and in removing rocks and other obstructions from the bottoms of rivers. If, therefore, the claim is intended to be made abstractedly, it seems to us that it cannot be sustained.

FLOWING OF SAND UNDER PRESSURE.

At the Royal Institution, an experimental account was given of the very curious experiments made by M. H. Burnand on the intermediate properties which sand exhibited between those of solid and fluid bodies. Sand prepared so as to be uniform and free from dust will flow in the air at angles above 30 or 32 degrees, but not at smaller angles. Sand put into a box or reservoir, and allowed to flow out at an aperture, either in the bottom or side, amounts to the same quantity passed, whatever the head of sand may be, or whatever the pressure there exerted, being in this respect quite unlike fluid; so that perhaps it may be made to constitute a moving force probably more independent of deranging causes than any other which can be devised. When a perpendicular tube is filled with sand, very little of the weight is borne by the bottom of the tube; indeed only so much as would equal the weight of a cone of sand standing on that bottom; but nearly the whole is supported by the sides. If a tube an inch in diameter be filled for about six inches or more with

sand, and laid horizontally, all attempts to push the sand out of the tube by a stick of nearly the same diameter will fail. These and many more curious facts, with their general principles and applications, were explained and illustrated.*

THE ÆOLOPHON, A NEWLY-INVENTED INSTRUMENT.

When Lord Stanhope first launched his model-boat on the Serpentine, no one expected to see the time when steam and paddles should suffice to carry "a tall ship" across the broad Atlantic. As little did we, when we were first amused by that very pretty musical toy, the German Æolina, anticipate, that within three years we should hear such an instrument as the one we are about to describe. In shape, size, and compass, the Æolophon is the counterpart of a cabinet piano-forte, having six octaves of keys extending from FF to F; and its sounds are produced by a series of metallic springs, set in vibration by the action of the air produced from a bellows. It has three pedals—one for filling the wind chest, and the others regulating the swell. The tone of this instrument, particularly in the middle and lower parts of its compass, is among the most beautiful we have ever heard, and much superior, both in body and quality, to that of any chamber organ of equal size; added to which, the Æolophon has the inestimable advantage of never varying its pitch, or getting out of tune.

From the nature of this instrument, it will be readily conceived that its best effects are displayed in slow movements, and the sustaining and swelling long notes; but to our surprise, as well as pleasure, we found that a running passage, even of semitones, could be executed upon it, if not with all the distinctness of a Drouet or a Nicholson, with as much clearness as on any organ. As an accompaniment to the piano-forte, it will be found an admirable substitute for the flute, clarinet, oboe, bassoon, or even violoncello; but perhaps its widest range of usefulness will be discovered in small orchestras, where the set of wind instruments is incomplete—the effects of any, or even all of which, may be supplied by one or two performers on the Æolophon reading from the score or even from separate parts.

It is now about a year since that a patent was obtained for the springs, and this peculiar mode of applying them, by Messrs. Day and Co.; immediately upon hearing the effect of which, Mr. Chappell, of Bond-street, entered into an engagement with the patentees for the agency of their patent, and the manufacture of instruments under it.†

LAWS OF VIBRATION.

On June 11, Mr. Faraday gave as one of the series of evening communications, at the Royal Institution, the following on the

* Phil. Mag. † Harmonicon.

laws of co-existing vibrations of strings and rods, the matter and illustrations of which are supplied by Mr. Wheatstone. The separate vibrations of a string as a whole, or as subdivided by nodal points, were first shown, and then the co-existence of two or more modes of vibrations in the same string, and the consequent form of the string in different parts of its vibration, illustrated by diagrams. Then the manner in which rods vibrated either in the lowest or in any higher mode was shown, and reference here made again to the co-existing vibrations, and to their combination also with motion of a more general and ordinary kind.

The experiments of Dr. Young were then referred to, in which he observed the figure of the orbit described by any part of a vibratory string, by remarking the line described by light reflected from it, after which the Kaleidophone of Mr. Wheatstone was resorted to for further illustration of these effects. This instrument consists essentially of an elastic steel wire, twelve or fourteen inches long, fixed firmly in a vice or foot at one end, and at the other furnished with a round metallic bead. This serves as a convex mirror, and if held in the sun's rays, or near a single light, as a lamp or candle, reflects a spot to the eye. When the wire is made to move, the spot describes an orbit of various shapes, according to the path of the end of the wire; and if vibrations be inflicted on the wire, either by tapping it with a finger or by drawing a violin-bow along it, these are rendered visible, by the forms which they impart to the orbit. The application of this instrument to the demonstration of co-existing vibrations was then made, in many ways.

Mr. Faraday also referred to certain new and curious forms observed when the eye has a motion given to it, either perpendicular to or across the path of the vibrations; a compound result of the motion of the eye with the motion of the vibrations, or moving particles is obtained, which is more or less oblique, according to the ratio of the velocities of the two motions. It is expected that extremely rapid motions, defying all ordinary examination, may in this way be measured; but as the subject is at present under consideration, it will be returned to very shortly.

The meeting then adjourned for the season.*

LACKER FOR TIN.

Take eight ounces of amber, two ounces of gum lac, melt them in separate vessels, and mix them well together; then add half a pound of drying linseed oil. Into a pint phial put half a pint of spirits of turpentine, and digest in it a little saffron; when the colour is extracted, strain the liquor, and add gum tragacanth and anotto, finely powdered, and in small quantities at a time,

* Phil. Mag.

till the required tone of colour is produced; then mix this colouring matter with the first compound before prescribed, and shake them well together till a perfect union takes place. If this varnish be laid over silver-leaf or tin-foil, it will be difficult to distinguish it by the eye from gold. It is by a varnish of this kind that leather, paper, or wood, covered with silver-leaf, is made to appear as if it were gilded. The lacker is also applicable to tin-plate articles, but small articles of finely polished brass are usually coated with a thinner composition.*

MARCH OF IMPROVEMENT IN AMERICA.

When the project of a canal between Erie and the Hudson was first communicated by Judge Forman to Mr. Jefferson, the latter replied—"It is a very fine project, and may be erected *a century hence*. You talk of making a canal 250 miles through a wilderness! It is little short of madness to think of it at this day." This was in 1809. Mr. Jefferson lived to see the project completed. The canal was not, indeed, made through a wilderness, for that wilderness had become, in a short time, one of the most remarkable examples of human industry to be found in the world. Mr. Jefferson is reported to have observed on a subsequent occasion—"I once said the project of this canal was a century too soon, but I am now convinced I was a century behind a just estimate of the march of improvement in this country." When the act for the formation of this canal passed, it was estimated that the traffic upon it would not, for some years, exceed 200,000 tons, but the very first year it was opened, the amount was upwards of 600,000 tons.

EXPORTATION OF MACHINERY.

It appears from a return recently made in parliament, that the value of the machinery exported from this country, for the last six years, has been as follows:—

	£.
1824	129,652
1825	212,416
1826	233,955
1827	214,129
1828	265,368
1829	256,539

In 1824, the value exported in "steam-engines, and parts of steam-engines," was £28,123. In 1829, this item had increased to £133,573, forming more than one half of the whole machinery exported.

* Mech. Mag.

CABLES AND LAUNCHES.

THE Hon. Captain G. Elliott has invented a connecting shackle for joining the ends of an iron and hempen cable, by which the tedious and unsafe process of joining them by the tails of the latter is avoided. Experiments have been made on Captain Elliott's invention, which have established its superiority; and we hear that it will be generally adopted. Captain Elliott has also suggested a method of fitting the launch of a ship in a manner that will enable her to carry out her best bower anchor, without any previous preparation, and so that it will not interfere, in any manner, with the ordinary duties of the boat.*

CANTERBURY AND WHITSTABLE RAIL-ROAD.

THIS rail-road has been opened for public traffic. It is between six and seven miles in length, and has been five years in progress. For the first four miles it proceeds on an inclination of one in ninety, by which wagons proceed, by the force of their own gravity, at the rate of twenty-five miles an hour. The rest of the rail-way is nearly level, and here locomotive steam-engines are made use of. At one part there is a tunnel 822 yards in length, carried through the Brethren Hills. The immense advantages which this district will derive from this rail-way may be anticipated, from the circumstance that coals alone will experience a reduction of sixpence a chaldron for carriage. Passengers will also be conveyed for sixpence or ninepence per head in twenty minutes.†

SAILING ON LAND.

From the Charleston (U. S.) Courier, of March 20.

A SAIL was set on a car on our rail-road, yesterday afternoon, in the presence of a large concourse of spectators. Fifteen gentlemen got on board, and flew off at the rate of twelve to fourteen miles an hour. Thirteen persons and three tons of iron were carried about ten miles an hour. When going at the rate of about twelve miles an hour, and loaded with fifteen passengers, the mast went by the board, with the sail and rigging attached, carrying with them several of the crew. The wreck was descried by several friendly ship-masters, who kindly rendered assistance in rigging a jury-mast, and the car was soon again put under weigh. During the afternoon the wind changed so as to bring it nearly a-head, when going in one direction; but this did not stop the sport as it was ascertained that the car would sail within four points of the wind.

* United Service Journal, for May, 1830.

† Abridged from the Morning Herald.

THE ÆOLINA.

On May 21, at the Royal Institution, Mr. Faraday lectured on the application of a new principle in the construction of musical instruments. The principle here referred to is that which has lately been so popular in the musical intruments called Æolinas. A spring generally in the form of a parallelogram being fastened at one end to a plate with an aperture of corresponding size, so as nearly to fill the latter, is put into isochronous vibration when the breath is urged past it, and produces musical sound. The laws of the vibrations of rods and springs were referred to, and then all the instruments which have been constructed on this principle, from the ancient Chinese organ to Mr. Day's Æolian organ, were produced and explained; amongst them were of course the Æolina and Mr. Wheatstone's orchestrion, the fingering and powers of which were fully explained. Each instrument had its capabilities exhibited by performances. Mr. Wheatstone supplied the philosophy of the evening.*

DECIMAL SYSTEM.

The Canadian legislature adopted, last month, the monetary part of the decimal system of account inserted in the *Mechanics' Magazine*, Nos. 315—318. (See *Times* and *Herald*, April 22.) *The Times* of April 26, reports the value of the Chinese tale to be one-sixth less than six-eighths. It was so valued in the *Mechanics' Magazine*, No. 334.

STEAM-PLOUGHS.

Two very ingenious mechanics, Messrs. Wykes and Phillips, Market-street, Edgware-road, have produced the model of a ploughing, or more properly, a digging or grubbing-machine, to be impelled by steam. The model is well worth examining. It is arranged on the principle of rendering the action of grubbing the fulcrum for moving forward the machine; so that, a certain power of steam being applied, the machine would move along a ridge, or a breadth of such a number of feet as might be determined on, (say six, ten, twelve, or fifteen feet,) at a greater or less rate, according to the tenacity of the soil. Such a machine would, no doubt, be applicable to many of the purposes of field culture, and more especially to the working of fallows. But it would not answer for ploughing up leys, or recent or tender grass-lands to be sown after once ploughing; neither would it plough in manure, nor form lands into drills for turnips or potatoes; nor would it harrow, hoe, or mow, or reap, all which might be done by steam, as before observed.

To apply steam successfully to agriculture, it has always ap-

* Harmonicon.

peared to us that the engineer ought not to seek for a new implement, but simply for a convenient locomotive power for impelling the implements already in use, modified so as to suit the new impelling power. The power for dragging forward Lambert's mole-plough (*Encyc. of Agr.* § 2523) supplies the germ of this idea. There would be no difficulty in inventing a locomotive-engine that would move itself any where, either on rough or smooth, level or sloping surfaces. There would be no difficulty of stopping this machine at any one point, throwing out or down long levers, with claws at the extremities, to serve as grappling-irons to retain it firmly in its position. There might then be a vertical gin-wheel, with a chain, say of 100 yards. Supposing the locomotive-machine taken to the first ridge of a field, the chain wound up, and the end of it attached either to one or many ploughs, harrows, or other implements. Then let the machine be put in motion, and advance ninety yards, unwinding the chain, which will now lie on the ground in a line between the steam-machine and the plough or harrow-machine. Now reverse the turning of the gin-wheel, and the plough will be dragged up to the engine. Change the wheel, lift up or draw in (all, of course, by the machine itself) the grappling-levers, and proceed as before. To some this may seem, at first sight, a slow and awkward mode; but, if a ridge of twelve feet were ploughed, or the width of three ridges harrowed, every time the machine advanced, a twenty-acre field would soon be got over. Nothing could be easier than to adapt ploughs and all implements, even Bell's reaping-machine, the thrashing-machine, &c. to such a locomotive power. Whenever an ample reward is offered, the thing will be done. Or whoever thinks fit to employ such an engineer as Brunell, will have the locomotive power invented and executed in a month, as a matter of course. If this mode is not adopted, stationary engines, at the ends of the ridges, must be resorted to; or fixed points, found or placed there, to which an engine and plough, attached by a chain, might plough itself forward. We recommend the subject to the Mechanics' Magazine. It must never be forgotten, that independently of the saving of horses and their food, the farmer would never be obliged to work his soil but when it was in a proper condition for that purpose. This, in our opinion, is one of the principal arguments in favour of the application of steam to agriculture.*

NEW CAMERA OBSCURA.

(By Mr. James, Optician, Bloomsbury.)

It makes manifest, by the rotary motion of a very fine screw, the cause why some are troubled with short sights and others with weak sights. Every motion it makes moves the little lens called

* Gardeners' Mag.

the crystalline humour to and from the glass called the retina, and in each motion the instrument obscures the little inverted picture (save and except when its adjustment stands fair to fall even upon the retina), and by a change of two little lenses, the different degrees of short and weak sights experienced in the human eye are made manifest. The corrective glasses have a very pleasing effect when you place before the instrument, as you would before the eye, a suitable concave or convex number, according to the degree the instrument stands at. So decidedly does the instrument show the cause of difference in the natural eye, that I think it may not be inaptly called the little eye-crometer.

IRON FURNACES IN ENGLAND AND SCOTLAND.

THE number of high furnaces in 1740 was but fifty-nine. This number has been increased as follows:—

1740,	59 furnaces, producing	17,000	tons
1788,	85	68,000	—
1796,	121	125,000	—
1806,		250,000	—
1820,		400,000	—
1827,	284	690,000	—

Of the two hundred and eighty-four furnaces last mentioned, ninety-five are in Staffordshire, and ninety in South Wales.

PROJECTILES-EXTRAORDINARY.

THE effect described in the first part of the following communication, for which we are indebted to an officer of the army, and an eye-witness, is so extremely peculiar, that we feel induced to point it out to the attention of our scientific readers as well worthy of investigation.*

The natives of New South Wales have the art of throwing a curved flat stick, made of very heavy wood, and in the form of a crescent, with such force and accuracy, as to break a man's leg at sixty or eighty yards; but the strange peculiarity of it is, that it can also be thrown to the distance of a hundred yards and upwards in the air, and, without striking any thing, will return to the person who threw it, and even pass beyond him twenty or thirty yards. A similar stick is used by a people to the southward of Trichinopoly, the Colareese: they, however, only use it for straightforward purposes, and do not understand how to make it return. Captain Cook, when at Botany Bay, having seen the Bomarang, concluded it was a wooden sword; and under that idea, conjectured that the natives of New South Wales were descended from Malays, from the supposed similarity of the Bomarang to the Malay sword. The New Hollanders also have a

* Mechanics' Mag.

method of discharging their spears, which surpasses any other that I have heard or read of. The spears they use are from seven to eight feet long, and they are cast by means of a flat stick called a Womora, about a yard in length, with a sort of hook at the point of it, on which the hinder end of the spear rests; this stick acts as a sling or lever; by this means the spear can be thrown to the distance of a hundred and twenty yards: with the hand alone, the spear cannot be thrown beyond fifty yards.

FILTRATION UPWARDS.

We extract the following paper from the *Boston Mechanics' Magazine*:—

Mr. Editor,—A few months since, a friend pointed out to me, in one of the British periodicals, the specification of a new patent for filtering by ascension, with all that easy philosophy which would naturally occur to any one who might stumble upon this inverted process of filtration; observing to me, "this is an old acquaintance of yours." To this friend, who has a taste for the mechanic arts, I communicated, about twenty years ago, the manner in which I obtained pure water on board ship from water that was ropy, and quite fetid. I had my family with me, and coming from France, I had vegetables packed in sand, and some bags of charcoal for a cooking apparatus; my children could not drink the water, and I first thought of using charcoal, that great and fashionable chemical agent, which was so much in use at that time amongst the French philosophers. But on reflection I determined to add something of my own to the process, and to combine chemical and mechanical means together. I took a wooden vessel, and made to it a false bottom, distant from the real bottom about two inches; on the false bottom, which was perforated with holes, I laid a piece of linen, and on that a stratum of sand, then a stratum of pulverized charcoal, and so on, alternate layers, to within about two inches of the top. Between the false and the real bottoms I inserted a tap, then fixed in the hole of the tap a hollow reed, upright, and a little higher than the wooden vessel; into this reed I poured the corrupt water, which was pressed upwards through the filter by the superior elevation of the tube. In about half an hour the water began to appear above the linen that covered the upper stratum of the filter, perfectly pure and limpid, I drew it off by means of a quill inserted near the top. My invention was much appreciated by the passengers, and I had more customers than I could satisfy.

Some years after this, being in Washington, I heard Mr. Brown, then a senator from Louisiana, speaking of the water of New Orleans as being turbid. I then told him of my combined ascension filter, and proposed for his consideration, a plan for filtering the water of the Mississippi on a large scale for the city. The plan was as follows:—

To sink cisterns about ten feet below the surface of the water in the river, construct false bottoms of wood, brick, or stone, perforated with small holes; on these bottoms lay a stratum of coarse gravel, six inches thick, then a succession of strata of the same thickness, but diminishing in fineness to the finest sand. The top of this filtering mass should be covered with a perforated cover, one foot at least below the low water mark of the river. The water was to be introduced into the bottom of the

cisterns by a leaden pipe; and to avoid the necessity of cutting the levee or dike too low, I proposed to apply the syphon principle; the leaden pipes acting as such, and being once charged, would continue to flow so long as the water of the river was higher than the upper covering of the cisterns. The leaden tube might be placed inside or outside of the cisterns. For the convenience of cleaning the cisterns from the sediment, it was proposed to have a small man-hole from top to bottom.

The philosophy of my invention was this—It is known that the deposition of sediment, from fluids, is in the combined ratio of their specific gravities, and the quiescent state of the fluids. When the depositing matter is nearly of the same gravity with the fluid, the least agitation will bring it back from the bottom, and keep it in motion; therefore the most perfect repose is necessary for the deposition of many particles which adulterate water. I concluded, then, that as soon as the fluid came in contact with the under surface of the false bottom of the cistern, it must be perfectly still, and the deposit would be the more rapid, and increase, perhaps, with the increased resistance which would be met in ascending through a denser medium. By this arrangement I presumed that the filtering mass would not be soon saturated; for most of the heavy particles in the water would receive a direction downwards, before the water had time to penetrate beyond the perforated false bottom, and many of the lighter particles would adhere to the under surface of the false bottom till the more perfect depuration of the water below should allow them also to descend.

If I am not deceived, a filter on this plan may be easily made which would make hard water soft, by depriving it of those calcareous particles which furze up our tea-kettles, and, perhaps, leave dangerous deposits in our bodies. The open order of the filter, occasioned by the gradation of coarseness in the gravel, downwards, would enable it to be rinsed by stopping the flow of water, taking out what water was in the cistern, and then throwing pure water over the upper covering; but still better, by taking off one or two of the upper strata of sand.

I am not aware that this plan was ever adopted; the gentleman to whom it was suggested went soon after on a foreign embassy, and did not, I believe, return to New Orleans.

BOAT PROPELLED BY HORSES.

M. de Riva has brought to perfection a machine constructed partly of cast and partly of wrought-iron, which is set in motion by eight horses, and drives two paddle-wheels in the same way as if steam had been applied. It is also capable of giving the wheels a retrograde motion, and raises and depresses the wheels as occasion requires; by which last operation their occasionally excessive dip into the water, which derogates from their power, is remedied. This machine has been fitted up in a vessel, calculated to receive a cargo of 100 tons weight; and she has made several trips with the most satisfactory results. The company who have brought this plan to bear, have baptized the vessel by the name of "L'Amico alla prova," the proved friend."*

* Court Journal.

ON INVENTIONS FOR SAVING LIVES ON LAND AND AT SEA.

(By Thomas Cook, Esq., Lieutenant in the Royal Navy.)

THIS gentleman has, for several years past, constantly applied his thoughts and his mechanical skill to this great object. He was, many years since, rewarded by the Society of Arts, &c., for a *night life-buoy*, intended to assist any one who might fall overboard by night, it having an elevated light affixed to it, whereby the person might discover and gain the buoy, and it could also be seen by those on board the vessel, and thus enable them to send assistance. He has, more recently, invented *safety carriages*, in which he has so managed, that, in case of the horse or horses running away with the carriage, the coachman or passengers can cause the strength of the horse or horses to be exerted, in gradually stopping the carriage, as, the more they pull, the more powerfully do they restrain themselves. He has, however, just patented various improvements in the construction and fitting up of boats, which are well calculated to render them more safe and effectual in use. Thus he has introduced a canvass deck, secured nearly water-tight, on a level with the seats or thwarts of boats, and having bags formed of the same material for the reception of the legs of the crew and passengers, and thus he will be enabled to prevent much water from entering those parts of boats which are below the canvass deck, and, in order to permit the escape of the water which may lodge above this deck, he has provided scupper-holes through the boat's sides all around, on a level with the deck, which are generally closed, by means of metal plates screwed tight into the holes, but which can at any time be unscrewed to let the water run off, and be replaced again. He has likewise added to the buoyance of boats by lashing and otherwise securing two canvass bags filled with cork-shavings, around the gunwales, and which also serve as fenders to prevent injury to the boats in going alongside of wrecks. He has likewise contrived the means of letting go the ballast in case of a boat being stove, and thus lightening the boat of its weight. He has also invented an ingenious contrivance, by means of which the sail or sheet of a boat may be instantly released by the steersman, in case of a sudden squall coming on, and the sheet be left to shiver in the wind. Also, another invention, by means of which the hook on which the bight of the slings, by which boats are usually secured to the sides of ships, can be suddenly made to open and allow the slings to slip off, and the boat be thus left at liberty to be lowered into the water. And, lastly, he has applied a similar contrivance to the hooks of tackle-falls, by means of which those hooks can be let go, or turned, so as to allow the rope or line hung upon them, by which a boat was being lowered into the water, to slip off, and thus permit the boat instantly to float, although the ship be going at ever so quick a rate through the water. The value of

these different improvements can be readily appreciated by nautical men; and we sincerely hope that Lieutenant Cook will be amply remunerated for his benevolent exertions by their speedy adoption in the Royal Navy, and which would also inevitably cause them to be employed in other services.*

WATT'S STEAM-ENGINE INDICATOR.

(*From Mr. Farey's Evidence before the Committee on the Patent-Laws.*)

MANY years ago Mr. Watt invented and applied a small instrument, which he called an Indicator, to his steam-engine; it indicates what extent of plenum and vacuum is alternately formed within the cylinder in order to impel the piston when the engine is at work. It is of very important use in giving engine-makers true knowledge how to make good engines; and it was of very great use to the inventer, just as a hydrometer to a distiller. He kept it a profound secret for many years; and in 1814, when he published an account of his other inventions, he gave only an imperfect description of a part of this one, without any hint of parts which are essential to the successful use. A complete instrument afterwards fell into my hands in Russia, where it had been made by some of the people sent out from this country with Mr. Watt's steam-engines. At my return to England I made one, and also showed several other engineers how to make such for themselves; and since that time every one of these persons has very greatly improved his practice, by the light it has enabled him to throw upon an obscure part of the operation of steam in an engine.

WATT'S MACHINE FOR MAKING SCULPTURES.

(*From Mr. Farey's Evidence before the Committee on the Patent-Laws.*)

MR. WATT invented and made a machine for executing sculptures, which he never disclosed; he showed me many specimens of the performance in ivory and alabaster in 1814, and made me a present of one carved by his machine, which proved that it must have arrived at considerable perfection; he died in 1819, and, I believe never disclosed that invention any farther than as the machine may have explained itself. He was striving to make it carve marble and hard materials, and he showed me some first trials in stone, but they were not perfect, and he did not live to complete a large machine adequate for executing real sculptures in marble.

THE GERMAN SILVER,

WHICH is now coming into vogue, has been introduced, as its name denotes, by the Germans into Europe, but is nothing more

* Gill's Repos.

than the white copper long known in China. The Goldsmith's Company of London have thought it proper to warn the public by advertisements in all the newspapers that it does not contain a single particle of real silver. This is true, for it is only an alloy of copper, nickel, and zinc; but it would have done no discredit to their candour to add, that it is, on account of its perfect unalterability, superior for many purposes (such as musical instruments, touch-holes of guns, &c.) to either silver or gold. Although only now coming into known use in England, it has been no stranger to the manufactories of Birmingham for at least thirty years and more.

STEAM-NAVIGATION.

In March, 1786, the Legislature of New York granted to a person of the name of Fitch, and his descendants, the exclusive right of "making, and employing, and navigating, all kinds of boats or water craft, which might be impelled through the water by force of fire or steam, in all the creeks, rivers, and bays, and waters, whatsoever, within that state for fourteen years." Fitch never availing himself of this privilege, the New York Legislature, in 1798, repealed that Act, and granted the same privilege to Robert L. Livingston, under certain restrictions as to the time when he should accomplish his object. Nothing material, however, was effected until April, 1803, when Robert Fulton joined with him. By successive Acts, the exclusive privilege was secured to these gentlemen for thirty years; and between April and July, 1808, they gave the required evidence, "that they had constructed a steam-boat of more than twenty tons, propelled by steam, more than four miles an hour against the stream of the Hudson between New York and Albany." Thus were twenty-two years expended in bringing to perfection this noblest of human inventions.*

SAFETY-LOCK.

We have been favoured with an inspection of a new safety or protector-lock, apparently of great merit. It has been declared that, however complicated may be the wards or interior of a lock, it cannot be called perfectly secure from an ingenious artist. The inventer of this new lock therefore proposes to guard the key-hole, so that any attempt to force or pick the lock, must of necessity be discovered. For this purpose a small box or chamber, with a lid similar to a snuff-box, is affixed over the front of the lock, with a key-hole corresponding in size with that of the lock. The lid of this chamber being opened, the bolt is turned, and the key withdrawn in the usual way; after which a small paper label is laid over the key-hole, and the spring-cover shut down,

* Boston Mech. Mag.

so as to prevent any possibility of its removal except by violence. The person having the key can thus, in all cases, see, before he again opens the lock, whether any attempt has been made to open it during his absence. It is the invention of a Mr. Gottlieb, who holds an appointment in the Excise Office.*

EXPLOSION OF STEAM-BOILERS.

The following circular has appeared within the year:—

Philadelphia, June, 1830.

SIR,—"The Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts," have had their attention lately called to the subject of the explosion of steam-boilers, by the lamentable number of accidents that have occurred in steam-boats during the present season, and by the painful circumstances which have in many cases attended these accidents. They have long had the subject before them, and are impressed with the hope that those explosions were produced rather by imperfection in the construction, arrangement, or management of the machinery, than by any inherent and irremediable source of danger in the invention itself. Feeling a high interest in the promotion of the success of the mechanic arts, and especially of that of steam navigation, which with pride they consider as peculiarly the offspring of American ingenuity and perseverance, they have appointed the undersigned a committee for the purpose of inquiring:—

1st. What are the probable causes of the explosions of boilers on board of steam-boats?

2nd. If any, what are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?

3rd. By what means can those remedies be applied and enforced?

We are aware that no investigation of so difficult and extensive a subject can be productive of good, unless it occasions a concentration upon one point, of all the information that results from the use of steam-boats over so vast a country as ours during a period of upwards of twenty years. With this view, we beg leave to call your attention specially to it, and to request that you may be pleased to communicate to us the result of your observation, experience, or reflection, on these interesting questions. We shall feel thankful to you particularly for an account of any explosion which may have occurred in your vicinity, or under your observation, or of which you may have obtained correct information. By collecting the *facts* in a number of explosions, we may be able to arrive at some satisfactory conclusions as to the causes which produced them. We are aware that these may have been different in different cases, and we are by no means prepared to assume as certain, that a simple and efficacious remedy will be devised, but we hope it may be found, and without any undue interference with the rights of individuals, or with the freedom of commerce and industry.

We had at first proposed to draw up a series of questions for publication and circulation, but upon mature deliberation prefer to leave the subject open, assuring you, that any information or suggestion will be thankfully received and duly acknowledged in the report which we shall

* Literary Gazette.

make of the result of our investigation. We beg leave, however, to suggest a few general heads, which may direct your attention to those points upon which we are chiefly anxious to obtain information, viz.:—

The Boiler.—Its size, form, and relative thickness, the material from which it is made (of copper or iron, &c.); if of iron, whether of foreign or American iron, especially in the boilers that exploded.

Safety Valve.—Its form, size, load in proportion to the thickness of the boiler, liability to get out of order, facility of repair, number used, location of the valve.

Supply of Water.—Mode of insuring a sufficiency, how gauged?

Arrangement of the Boilers in the Boat.—Which is the least liable to accident?

Construction of the Boat.—To avoid the accidents in the boilers.

In addition to these we will add, it is our wish that the investigation should take the widest range, and we beg that you will give the same scope to your answer.

Please direct your reply to Mr. William Hamilton, Actuary of the Franklin Institute.

W. H. Keating,	J. K. Mitchell, M.D.
Robert Hare, M.D.	Benjamin Reeves,
S. V. Merrick,	George Fox,
A. D. Bache,	Thomas P. Jones, M.D.
Isaiah Lukens,	Walter R. Johnson,
James I. Rush,	M. W. Baldwin,
James Ronaldson,	James P. Espy,
Frederick Graff,	George Merrick.
R. M. Patterson, M.D.	

London, Sept. 1, 1830.

Any communications for the Franklin Institute sent to W. Petty Vaughan, No. 70, Fenchurch-street, will be forwarded to Philadelphia immediately, and much oblige the Committee, who are anxious to report before Congress meet.

CHEMICAL SCIENCE.

ON THE ILLUMINATION OF LIGHT-HOUSES.

By Lieut. Thomas Drummond, of the Royal Engineers.

THE author, after briefly describing the different methods at present employed for illuminating light-houses, proceeds to detail what he considers an improvement upon those now in use. This consists in substituting for the Argand burners a small ball of lime, ignited by the combustion of oxygen and hydrogen.

From this small ball, only three-eighths of an inch in diameter, so brilliant a light is emitted, that it equals in quantity about thirteen Argand lamps, or 120 wax candles; while, in intensity or intrinsic brightness, it cannot be less than 260 times that of an Argand lamp. These remarkable results are deduced from a series of experiments made lately at the Trinity-house; and, having been repeated with every precaution, and by different individuals, there seems no reason to doubt their accuracy. In the best of our revolving lights, such as that of Beachy Head, there are no less than thirty reflectors, ten on each side. If, then, a single reflector, illuminated by a lime ball, be substituted for each of these ten, the effect of the three would be twenty-six times greater than that of the thirty. On account of the smaller divergence of the former it would be necessary to double their number, placing them in a hexagon instead of a triangle. In this case the expense is estimated at nearly the same. This method was tried lately at Purfleet in a temporary light-house, erected for the purpose of experiments by the corporation of the Trinity-house, and its superiority over all the other lights with which it was contrasted was fully ascertained and acknowledged.

On the evening of the 25th of May, when there was no moon-light, and the night dark, with occasional showers, the appearance of the light viewed from Blackwall, a distance of ten miles, was described as being very splendid. Distinct shadows were discernible, even on a dark brick wall, though no trace of such shadows could be perceived when the other lights, consisting of seven reflectors with Argand lamps, and the French lens, were directed on the same spot. Another striking and beautiful effect peculiar to this light was discernible when the reflector was turned, so as to be itself invisible to the spectator. A long

stream of rays was seen issuing from the spot where the light was known to be placed, and illuminating the horizon to a great distance. As the reflector revolved, this immense luminous cone swept the horizon, and indicated the approach of the light long before it could itself be seen from the position of the reflector.

These singular effects must not, however, be understood as constant accompaniments of this light, for on a moonlight night, or when the weather is very hazy, they cease to appear.*

ON THE ELECTRO-MAGNETIC PROPERTIES OF METALLIFEROUS VEINS IN THE MINES OF CORNWALL.

By Robert Ware Fox.

THE author having been led, from theory, to entertain the belief that a connexion existed between electric action in the interior of the earth, and the arrangement of metalliferous veins, and also the progressive increase of temperature in the strata of the earth as we descend from the surface, proceeded to the verification of this opinion by experiment. His first trial was unsuccessful, but in the second, he obtained decisive evidence of considerable electrical action in the mine of Huel Servel, in Cornwall. His apparatus consisted of small plates of sheet copper, nailed, or else wedged closely, against the wooden props stretched across the galleries. Between two of these plates of different stations, a communication was made, by means of copper wire, one twentieth of an inch in diameter, which included a galvanometer in its circuit. In some instances three hundred fathoms of copper wire were employed.

The intensity of the electric currents was found to differ considerably in different places; it was generally greater in proportion to the greater abundance of copper ore in the veins; and in some degree also to the depth of the station. Hence the discovery of the author seems likely to be of practical utility to the miner in discovering the relative quantity of ore in veins, and the directions in which it most abounds. The electricity thus perpetually in action in mines, does not appear to be influenced by the presence of the workmen and candles, or even by the explosion of gunpowder in blasting.

The author's experiments enable him to give a table of the relative powers of conducting galvanic electricity possessed by various metalliferous minerals. This power, he remarks, appears to bear no obvious relation to any of the electrical or other physical properties of the metals themselves, when in a proper state, or to the proportions in which they exist in combination. He proceeds to point out various facts relative to the position of veins and the arrangement of their contents, which he thinks

* Philos. Trans.

are irreconcilable with any of the hypotheses that have been devised to explain their origin.

He observes that ores which conduct electricity have generally some conducting substances interposed in the veins between them and the surface; a structure that appears to bear a striking analogy to the ordinary galvanic combinations. He is of opinion that the intensities both of heat and of electricity, and consequently of magnetism, increase in proportion to the depths of the strata under the surface of the earth; that they have an intimate connexion with one another; and that the discovery of electrical currents in various, and frequently opposite directions, in different parts of the same mine, may, perhaps, hereafter afford a clue to explain the declination and variation of the magnetic needle.*

DECOMPOSITION OF WATER BY ATMOSPHERIC ELECTRICITY.

M. Bonijol, conservator of the reading society at Geneva, has constructed many very delicate apparatus, by means of which water may be readily decomposed by the electricity of the ordinary machine, and also by atmospheric electricity. The electricity of the atmosphere is gathered by means of a very fine point fixed at the extremity of an insulated rod; the latter is connected with the apparatus, in which the water is to be decomposed, by a metallic wire, of which the diameter does not exceed half a millemeter (1-50th of an inch.) In this way the decomposition of the water proceeds in a continuous and rapid manner, notwithstanding that the electricity of the atmosphere is not very strong. Stormy weather is quite sufficient for the purpose.†

DECOMPOSITION BY ORDINARY ELECTRICITY.

M. Bonijol has also succeeded in decomposing *potash* and the chloride of silver, by placing them in a very narrow glass tube, and passing a series of electric sparks from the ordinary machine through them. The electricity was conducted into the tube by means of two metallic wires fixed into the ends. When a quick succession of electric sparks had taken place for about five or ten minutes, the tube containing chloride of silver was found to contain reduced silver: and when potassa had been submitted to the electric current, then the potassium was seen to take fire as it was produced.‡

EMISSION OF LIGHT DURING THE COMPRESSION OF GASES.

When certain gases have been suddenly compressed, the evolution of light has been observed; at first this was supposed to be the case with all gases; but M. Soissy, of Lyons, stated, that

* Philos. Trans. † Bib. Univ. ‡ Ibid.

it happened only with oxygen, air, and chlorine, a result which has been confirmed by M. Thenard. The latter philosopher, on reflecting that the pistons used had been greased, thought the light perhaps might be due to the formation of a little water, or muriatic acid, in these cases; and therefore repeated the experiments with pistons moistened only with water, and then found that no light was evolved.

He then made other experiments on the inflammation of various substances in compressed oxygen, chlorine, &c. We are constrained to omit the detail of these, but the following are the conclusions to the paper:—1. No gas becomes luminous of itself by pressure exerted in the ordinary manner in cylinders by pistons. 2. The highest pressure which can be given by the hand to gas in a tube of glass raises the temperature much above 400° F. Powders which are not decomposed at this temperature explode instantly in azote, hydrogen or carbonic acid gas, suddenly compressed. 3. Paper and wood inflame in oxygen suddenly compressed, and oiled paper inflames in the same manner in chlorine. 4. If the gases be compressed more forcibly and suddenly, they would doubtless attain a much higher temperature; but it is not probable that they would of themselves become luminous, except at very high temperatures.*

LAWS OF ELECTRICAL ACCUMULATION.

Mr. Harris, of Plymouth, has made an extensive series of experiments on the laws of the accumulation of ordinary electricity. The details of these experiments, with illustrative plates, are published in the Transactions of the Plymouth Institution, 1830. We have not space for more than the conclusions at which he arrives.

1. An electrical accumulation may be supposed to proceed by equal increments. A coated surface, charging in any degree short of saturation, receives equal quantities in equal times, all other things remaining the same. The quantity passing from the outer coating is always proportional to the quantity added to the inner.

2. The quantity of matter accumulated may be estimated by the revolutions of the plate of the electrical machine, supposing it in a state of uniform excitation; or it may be measured by the explosions of a jar connected with the outer coatings. It is as the surface multiplied by the interval which the accumulation can pass: when the surface is constant, it is as the interval; when the interval is constant it is as the surface. It is also as the surface multiplied by the square root of the free action or intensity: when the surface is constant, it is therefore as the square root of the attractive force.

* Ann. de. Chimie.

3. *The interval which the accumulation can pass is directly* proportional to the quantity of matter, and inversely proportional to the surface: it is as the quantity divided by the surface: if the matter and surface be either increased or decreased, in the same proportion the interval remains the same. If, as the matter be increased, the surface be decreased, the interval will be as the square of the quantity of matter.

4. The force of the electrical attraction varies in the inverse ratio of the square of the distance between the points of contact of the opposed conductors, supposing the surfaces to be plane and parallel; or otherwise between two points which fall within the respective hemispheres at a distance equal to one-fifth of the radius, supposing the opposed surfaces to be spherical.

5. The free action or intensity is in a direct proportion to the square of the quantity of matter, and in an inverse proportion to the square of the surface: it is directly as the effect of an explosion on a metallic wire, all other things remaining the same. If the matter and the surface increase or decrease together, so in the same proportion the attractive force remains the same. If, as the matter be increased, the surface be decreased, the attractive force is as the fourth power of the quantity of matter.

6. The effect of an electrical explosion on a metallic wire depends exclusively on the quantity of matter, and is not influenced by the intensity of free action. It is diminished by accumulating the matter on a divided surface: it is as the square of the quantity of matter: it is as the square of the interval which the accumulation can pass: it is directly as the attractive force of the free action, all other things remaining, in each case, the same: it is as the *momentum* with which the explosion pervades the metal.

PREPARATION OF NITROGEN.

When zinc is dipped into fused nitrate of ammonia, it is instantly oxidized and dissolved, and nitrogen and ammoniacal gases are evolved. The zinc disappears with as much rapidity as when exposed to the strongest mineral acids; and, at the same time, so completely sustains the requisite temperature, that it becomes unnecessary to continue the application of heat after the action commences. The heat required is 280 deg or 300 deg., but a small piece of zinc soon elevates it to 540 deg. No nitrous or nitric oxide could be detected in the evolved gas, and therefore Professor Emmett recommends the operation as one well fitted to supply nitrogen gas.

A tubulated retort is to be partly filled with the nitrate of ammonia, and a cork fitted to the tubulature. Through this cork is to pass freely either a knitting-needle or an iron wire, holding by means of a hook, the coil of zinc. As soon as the salt has entered into fusion, the knitting-needle must be pushed down far

enough to place the zinc in contact with the nitrate. This arrangement is not only convenient but necessary; for if the zinc be thrown at once into the fused salt, the action will prove too violent and unmanageable; whereas, when contact is not constantly maintained, there is a strong tendency towards a vacuum in the retort, which would endanger its safety. By the process here recommended, there is no liability to accident, and the quantity of nitrogen may be easily regulated, by raising or lowering the zinc. Every grain of the metal furnishes nearly a cubic inch of the gas, while the ammonia, which also escapes, becomes wholly condensed as soon as it enters into the water of the pneumatic cistern.*

PULVERIZATION OF PHOSPHORUS.

If phosphorus be put with alcohol into a bottle, and shaken for some time, it may be obtained in powder of the utmost tenuity, which, when diffused through the alcohol, appears as if it consisted of a multitude of minute crystals.†

INFLAMMATION OF PHOSPHORUS BY CHARCOAL.

Dr. Bache, of Philadelphia, states, that, at the temperature of 60 deg. F., or upwards, carbon in the form of animal charcoal, or lampblack, causes the inflammation of a stick of phosphorus powdered with it; the effect takes place either in the open air, or in a close receiver of a moderate size.‡

PREPARATION OF BI-CARBONATE OF SODA.

The following method of preparing this salt, in the large way, is described by Mr. F. R. Smith, of Philadelphia. The ordinary crystals of carbonate of soda are placed in a box made on purpose, and are surrounded by carbonic acid gas under pressure. The salt absorbs the gas, and, as the bi-carbonate requires but little water, much of that contained in the crystals of the original carbonate drip away in the form of a solution. When gas ceases to be absorbed, the salt is taken out, and dried at a moderate temperature.

Upon examination, after the absorption of gas has ceased, the portions of salt are found in their original form, but porous and friable, and the fracture without lustre. Each consists of an aggregation of crystalline grains as white as snow, and scarcely alkaline to the taste. In this way all the trouble of solution,

* Professor Emmett—Silliman's Journal. † Casaseca.
‡ Silliman's Journal.

evaporation, &c., involved by the ordinary process, is obviated. The production of gas should be continued for a sufficient time, and the subsequent drying of the salt should be at a moderate temperature, or else portions of carbonate may remain.

When a portion of salt thus prepared was washed with a little water, to remove any carbonate, then dried and analyzed, it proved to be, not sesqui-carbonate, but true bi-carbonate. M. Boullay has repeated the process on a large scale, and obtained exactly similar results.*

ROCK SALT IN ARMENIA.

ARMENIA was incorporated with Russia in 1828, by the treaty of Tourkmantchai, made with Persia. The salt is found in a mountain two leagues and a half from Nakchitchevane, situated on an extensive plain extending along the left bank of the Araxes. The mountain is seven leagues and a half in circumference, and, from the appearance of very ancient works, has evidently yielded salt for many ages. These remains consist of enormous horizontal galleries, supported by pillars of salt; and, according to the traditions of the people, many mines have been abandoned from the difficulties of working them, occasioned by the depth of the strata and frequent inundations. The Persian government, for the last fifteen years of its time, let them for a sum equal to 16,000 francs annually.

The salt is worked by gunpowder; the works are wrought by the inhabitants of a small neighbouring village, consisting of Armenians and Tartars, from three to twenty persons being required at a time. The Russian government has let the works, since March, 1829, for a year, for a sum equal to 16,000 francs.†

NEW KIND OF INDIGO.

THE *Registro Mercantil* of Manilla describes a new kind of indigo lately discovered in that island. This plant has been long known to the natives, especially in the provinces of Caramina and D'Albay; they give it the name of *payanguit* or *avanguit*, and obtain a superb blue colour from it. In 1827 it attracted the attention of Père Mata, one of the members of the Economical Society of Samar. He made many experiments upon it, formed it into cakes, and dyed cotton, linen, and silk goods with it. The colour he obtained was so rich, and so equal to that of indigo, that he sent some of the cakes and the dyed fabrics to the Society, who directed other members residing in the same province to repeat Père Mata's experiments. All obtained most satisfactory results, and they sent many of the cakes, the leaves, and even the living plants, to Manilla. A committee of merchants

* Journ. de Pharm. † Revue Enc.

and chemists was appointed to ascertain, by every kind of trial, whether the colouring matter was identical with that of indigo, and might be introduced as such into the market at the same price. The committee reported in the affirmative on these points, declaring that the *payanguit* had all the valuable properties of the plant to which it had been compared.*

CHANGE OF COLOUR IN THE WOOD OF CERTAIN TREES.

M. Marcet has experimented upon this point, particularly with the wood of the alder, which, exposed to air, becomes red or brown. The change did not take place if, the instant the wood was cut, it was introduced into a perfect vacuum, or into gases containing no oxygen; but, on the contrary, being put into oxygen, the red colour became more vivid than in the air. If the wood, when cut, was plunged into water, it always reddened, whatever attempts were made to exclude oxygen. Some of the wood, which had acquired a yellow colour, communicated that colour to water, and the water, being evaporated, left a substance having every character of pure tannin. M. Marcet concludes, from his experiments, that the colouration of the alder wood is always due to a degree of oxygenation which the tannin undergoes immediately upon its exposure to the air or oxygen.†

PRESERVATION OF BLOOD.

Sugar refiners and others are often inconvenienced by the difficulty of obtaining blood at the time when it is required for use. M. Toursel has endeavoured, in part, to remove this difficulty, by proposing a method of preserving this agent for some time without injury. It consists in putting the blood into bottles or other vessels with very narrow mouths, and being careful to fill them up to the neck; a layer of oil, to the depth of at least half an inch, is then put upon it to cut off communication with the atmosphere, and the whole is left to itself. M. Toursel states that he has in this manner preserved blood, with all its physical and chemical qualities, from the 1st of December, 1827, to January, 1829.‡

ON THE DISTILLATION OF NITRIC ACID.

By E. Mitscherlich.

During the decomposition of nitre by sulphuric acid, there are some circumstances regarding the combination of the acid with the potash of the nitre, which have hitherto been but little attended to. Of the three compounds of sulphuric acid and potash with which we are acquainted, the sulphate and bisulphate

* Bib. Univ. † Ibid. ‡ Journ. de Commerce.

only require our consideration with respect to the above process, the former of which is sufficiently known; the bisulphate contains twice as much acid as the sulphate; and water, the oxygen of which is to that of the acid as one to six; this water is very fixed, and is not even evolved during the fusion of the salt at 392 deg. F., but only when the salt itself is decomposed; a property which the latter has in common with the sulphate of the protoxide of iron, and some other salts. It would accordingly, perhaps, be better to consider the bisulphate of potash as a compound of the hydrate of sulphuric acid and the sulphate of potash: it consists of 58.80 sulphuric acid, 34.61 potash, and 6.59 water.

If equal parts of the nitrate and the bisulphate of potash are distilled with half a part of water, until the emission of red vapours begins, which is the case at about 418 deg. F., the water in the receiver will be found to contain not more than one and a half per cent. acid of the nitrate employed; and it accordingly is evident that the bisulphate and the nitrate commence only to act on each other at that temperature. On increasing the heat, the retort becomes filled with red vapours; oxygen is evolved and nitrous acid distils over, and is dissolved by the aqueous nitric acid in the receiver. The emission of red vapours continues when the retort is red hot, and it appears, consequently, that even at so high a temperature a large quantity of the nitrate is left undecomposed by the bisulphate.

If the quantity of sulphuric acid employed be just sufficient to produce the sulphate, the temperature required for the distillation of the acid does not exceed 302 deg. F.; after half the quantity of the acid in the nitrate has been distilled over, the residue consists of bisulphate and nitrate of potash, which, on increasing the temperature, act on each other in the manner above described—viz., oxygen and nitrous vapours are evolved, and the liquid in the receiver is coloured by nitrous acid. The quantity of water employed in the process is quite indifferent, and influences only the strength of the distilled acid, which, previous to increasing the heat above 302 deg. F., is perfectly colourless. According to this process, that is to say, where the quantity of sulphuric acid is 48.41 to 100 of the nitrate, the quantity of nitric acid produced does not exceed 6-7ths of that previously contained in the nitrate.

Nearly the same result is obtained by distilling 100 parts of nitre with 72.6 of sulphuric acid; but in this, as well as in the last process, a very great heat is required to decompose the last proportions of nitre, part of the acid of which will, moreover, also be found to be lost. But if with 100 parts of nitre, 96.8 parts of acid are used, so that the bisulphate of potash is formed, the process will be found to be far more profitable, for none of the acid is lost: distillation takes place very easily, and at a heat not exceeding 248 deg. to 257 deg. F.; the nitric acid

obtained is of 1.512 gravity, which, by distillation, may be increased to 1.54. The former, which is colourless, contains 86.17; the latter is rather yellowish, and holds 88.82 per cent. of acid.

If water is added to the acid of 1.522, the boiling point of the liquid gradually rises; and, on distillation, first concentrated and then weak acid will be found to pass over. This continues, however, only until the quantity of water amounts to 44 per cent. of the acid, the specific gravity of which is then 1.40, and the boiling degree between 248 and 249 deg. F.; if the quantity of water is still increased, the boiling point falls, and the order of the distillation is, as it were, contrary to what it was observed before—viz., first weak and then strong acid is obtained. This likewise takes place during the distillation of nitric acid from nitre; for if, with 100 parts of nitre and 96.8 of sulphuric acid, the quantity of water is not equal to 44 per cent. of the acid formed, the first produce of distillation is strong, and the next diluted acid; if more water is employed, the contrary takes place.

It is, accordingly, most advantageous to use 100 parts of nitre, 96.8 of sulphuric acid, and about 40.45 of water, which will be sufficient, as the nitrate of potash always contains some water, and the sulphuric acid is seldom so concentrated as to contain less than 18½ per cent. The acid distils at 266 deg. F., and its specific gravity is between 1.4 and 1.395. 28 lbs. of purified nitre, with 13 9-16ths lbs. of sulphuric acid, of 1.85, yielded 34 lbs. of nitric acid, of 1.30 specific gravity; and the same quantity of nitre, with 27½ lbs. of sulphuric acid, gave 37¾ lbs., of nitric acid, of 1.30.* Besides, the first process required almost twice as much fuel and much more time than the second.

In conclusion, M. Mitscherlich mentions some remarkable properties of nitric acid, of 1.522 specific gravity. Iron, tin, and several other metals, may be put into, and even boiled in it, without the least effect; whilst zinc is immediately oxidized and dissolved.†

SPONTANEOUS INFLAMMATION OF POWDERED CHARCOAL.

M. Aubert, colonel of artillery, has made numerous experiments on the above subject: he states that charcoal when very finely powdered has the appearance of an unctuous liquid, and occupies only one third the space of sticks of charcoal of about six inches long.

In this state of division, it absorbs air much more rapidly than

* According to Thénard, from 100 parts of nitre and 66⅔ of sulphuric acid, 40.8 of very strong nitric acid, and from the same quantity of nitre with 144 parts of sulphuric acid, 81.6 parts of nitric acid of the same strength were obtained. These results appear to M. Mitscherlich to be erroneous.

† Poggendorff's Annalen.

when it is in sticks; still however the absorption goes on slowly, requiring several days for completion; it is accompanied with the disengagement of heat, which is to be regarded as the true cause of the spontaneous combustion of the charcoal; the heat is equal to about 350 deg. of Fahrenheit. The inflammation occurs towards the centre of the mass, at about five or six inches beneath the surface; the temperature is constantly higher in this place than in any other: there must consequently exist towards the edges of the mass a descending current of air, which tends towards the centre, and becomes vertical, without penetrating towards the lower parts of the mass, where the temperature is but little raised. It is on this account that a portion only of the charcoal appears to produce the phenomena; the remainder serves as an isolating substance, and preserves the heat in the centre.

The variations of the barometer, thermometer and hygrometer do not appear to have any sensible influence upon the spontaneous inflammation of the charcoal; if such influence exists, the experiments have not been sufficiently multiplied to prove it.

Black charcoal, strongly distilled, heats and inflames more readily than imperfect or slightly distilled charcoal.

The black distilled charcoal, which is the most inflammable, ought to be in masses of about 60 pounds at least, that spontaneous inflammation may take place; with less inflammable charcoal the inflammation occurs only in larger masses. In general the inflammation occurs more certainly and readily, as the time is short between the carbonization and powdering. Air is not only necessary for the spontaneous inflammation, but there must be free access of it at the surface; the weight which the charcoal acquires to the moment of its combustion, is derived not merely from the privation of air, but partly to the absorption of water. During trituration the air undergoes no change from the charcoal; nor does it suffer any up to the moment of its inflammation.

Sulphur and nitre, added to the charcoal, take away its property of inflaming spontaneously; still however there is absorption of air and heating; and although the increase of temperature is not very great, it is prudent not to leave these mixtures in too large masses after trituration.*

INFLUENCE OF THE AURORA BOREALIS ON THE MAGNETIC NEEDLE.

Mr. Sturgeon has mentioned, in his paper on the Aurora Borealis of Jan. 7th, as witnessed at Woolwich, that he could not observe the slightest change of direction or disturbance in the magnetic needle, during the display of the Aurora. As this is a subject of much importance, we deem it improper to publish this

* Ann. de Chim.

result, without stating, at the same time, that M. Arago, at the Observatory of Paris, was also engaged on the evening of the 7th, in observations on both the horizontal and the dipping-needle, during the appearance of the Aurora; and that he found the former to be deranged 1 deg. 6 min. 47 sec. by the influence of that meteor, and the latter the enormous quantity of 21 min., the ordinary diurnal variation of the dip, at this season, scarcely exceeding 1 min. An account of M. Arago's observations will be found in *Le National* of January 12th.

NITROUS ATMOSPHERE OF TIRHOOT.

Tirhoot is one of the principal districts in India for the manufacture of saltpetre; the soil is everywhere abundantly impregnated with this substance, and it floats in the atmosphere in such quantities, that during the rains and cold weather it is attracted from thence by the lime on the damp walls of houses, and fixes there in shape of long downy crystals of exceeding delicacy. From damp spots it may be brushed off every two or three days almost in basketsfull. In consequence of all this, the ground, even in hot weather, is so damp, that it is extremely difficult either to get earth of sufficient tenacity to make bricks (the country being quite destitute of stones), or, when made, to find a spot sufficiently solid to sustain the weight of a house. Even with the greatest care the ground at last yields, and the saltpetre corrodes the best of the bricks to such a degree, that the whole house gradually sinks several inches below its original level. Houses built of inferior materials of course suffer much more; one, of which the inner foundations were of unburnt bricks, absolutely fell down whilst I was at Mullye, and the family in it escaped almost by miracle. My own house, which was not much better, sank so much, and the walls at bottom so evidently giving way, that I was compelled with extreme expense and inconvenience, to pull down the whole inner walls, and build them afresh in a more secure manner. From the same cause a new magazine which Government directed to be built, with an arched roof of brick-work, was, when complete, found so very unsafe, that it was necessary to demolish it entirely, and rebuild it on a new plan, with a roof of tiles. In such a soil it will easily be concluded that swamps and lagoons prevail very much, of course, mostly during the rains, and till the sun gathers power in the hot weather; and, in fact, what has been above so much insisted on, as to the two contrary aspects of the country with respect to vegetation, may by a conversion of terms, be equally applied to the water on its surface. In the cold and dry weather it is comparatively scanty; in the rains it is superabundant; and as the rivers in this district are frequently found to change their situations, so, through a long course of time, it has resulted that hollow beds, being deserted by their streams, become transformed into what,

during the rains, assume the appearance of extensive lakes, but in dry weather degenerate into mere muddy swamps, overgrown with a profusion of rank aquatic vegetations, particularly the gigantic leaves of the lotus, and swarming with every tribe of loathsome cold-blooded animals. Some of these lakes, during the height of the rains, communicate with their original streams, and thus undergo a temporary purification; but others receive no fresh supply except from the clouds, and of course their condition is by much the worse. Some of the conversions of a river-bed into a lake have occurred in the memory of the present inhabitants, or at least within one descent from their ancestors.*

ESTIMATION OF THE VEGETO-ALKALI IN PERUVIAN BARK.

It is often important in pharmacy to be able to tell the value of a sample of bark, by ascertaining the quantity of quinia or cinchonia which it contains. MM. Henry and Plisson, and also M. Tilley, have published processes for this purpose. Professor Gobel applies the following method to obtain the same end:—Two ounces of powdered bark are acted upon, at successive times, by sixteen ounces of water and 180 grains of muriatic acid, specific gravity 1.13, ebullition being occasioned; all the liquids are to be put together, and caustic potassa added, which produces a brown precipitate; this is to be re-dissolved in dilute muriatic acid, again precipitated, and so on, until the precipitate is quite white; it is then to be dried, and treated with cold strong alcohol, to separate the quinia and cinchonia from each other.

M. Veltman has devised the following process, which may be applied to small quantities; it is easy of execution and exact:—55 grains of the bark in fine powder is to be mixed with an equal quantity of washed siliceous sand, the grains of which are about half the size of poppy seed; this is to be well mixed with five drops of muriatic acid, and 20 drops of alcohol, and pressed lightly into a glass tube 4¾ inches long, and 0.6 of an inch in diameter, one end of which has been covered with a little piece of muslin, and then inserted into a close vessel. The other end of this tube is to be connected by a bent tube with a small flask filled with a mixture of an ounce and a half of alcohol, and 20 drops of muriatic acid; the bent tube should be 0.2 of an inch in diameter; one end should go to the bottom of the flask, the other should reach the surface of the mixed bark and sand. The alcohol in the flask is then to be boiled by a small spirit lamp. It will pass through the tube and extract all that is soluble. If the ebullition is performed slowly, the last drops of alcohol pass nearly colourless. The reddish brown alcoholic tincture is to be precipitated by hydrated lime; after twelve hours it is to be se-

* Tytler on the Climate of Mullye, in Trans. Med. and Phys. Soc. of Calcutta.—Jameson's Journal, Jan. 1831.

parated by a filter, the liquor is to be rendered slightly acid, evaporated until in a soft state; then dissolved in 120 grains of water, and precipitated by a few drops of caustic ammonia. *The precipitate being dried, indicates the quantity of alkali in the bark. In this way, M. Veltman found that from* 3.3 to 6.0 parts *of vegeto-alkali were combined in 100 parts* of different varieties of bark.*

MOTION OF CURRENTS IN LIQUIDS.

M. Dutrochet has made some singular remarks on the influencing causes of the motion of currents in liquids, and has found light to affect them considerably. He finds that difference of temperature is the efficient cause, and that 1-800th of a degree of difference is sufficient, when aided by light. In the absence of light such motion will cease. When the windows of the experimental room are closed so much as only to admit light enough to distinguish, whether the circulating motion continues or not, it soon ceases; when re-opened, the motion recommences. When completely suspended by the absence of light, if the table be struck with slight blows, the vibration communicated immediately causes the motion to recommence; when the liquid was again at rest, the sound of a violoncello, or bell, was occasioned, and the vibrations communicated to the liquid, again caused it to acquire circulating motion. Hence it would appear that the vibration of the particles of a liquid favour the circulating motion which a slight difference of temperature is competent to produce; that this previous vibration is a necessary circumstance, and that light consequently only acts by producing it amongst the particles of the fluid. From whence M. Dutrochet concludes, that, in the phenomena of circulating motion in liquids, two causes operate—the *efficient* one, difference of temperature, the *accessory* one, light, or any other circumstance which can communicate feeble vibrations to the particles of fluid.†

A MASS OF METEORIC IRON DISCOVERED IN BOHEMIA.‡

The locality where this mass of meteoric iron was found, is the slope of a hill near the castle of Bohumilitz, in the circle of Prachin in Bohemia, the estate of Baron Malowetz of Skalitz. A ploughman, having on the 19th September, 1829, accidentally alighted upon it with his plough, and supposing the mass, which was afterwards found to weigh 103 pounds, to be an ordinary stone, he endeavoured to lift it, and throw it out, but being surprised with the great weight, he thought it must be a precious metal. A small bit of it, however, having been detached by a

* Bull. Univ. † Revue Encyc.

‡ Abstract of several papers in the Jahrbucher des böhmischen Museums. No. ii. 1830.

blacksmith with a hammer, it was recognised to be iron. Dr. Charles Claudi, an eminent lawyer of Prague, the proprietor of the neighbouring estate of Cykin, paying a visit to the baron, was shown the mass, and as there are no iron-works in the vicinity, he argued that it might have had a meteoric origin. This was fully confirmed by Professor Steinmann's discovery of nickel in it, and by the peculiar structure which is likewise detected in other kinds of meteoric iron by etching a polished surface. Upon the application of these gentlemen, Baron Malowetz presented the whole of this highly remarkable object to the National Museum at Prague.

There can be no doubt that this mass of iron has lain a long time in the soil, the plough having passed over it for ages; and it must be ascribed only to the heavy rains of last summer, that, much soil having been washed away, it came at last within the reach of the plough. Its having been a long time exposed to the agency of air and weather, is also testified by a thick crust of oxide of iron, with which it was covered when first dug out.

No conjectures can be made respecting the age of this mass. There is indeed a notice by Marcus Marci de Kronland,* that a metallic mass had fallen from the sky in Bohemia, in the year 1618, but without the locality where it had fallen.

According to the account by Professor Zippe, the Bohumilitz meteoric iron is an irregular lump of a somewhat quadrangular shape. It is marked on the surface with irregular roundish impressions, of the same kind as other masses of native iron, having a meteoric origin. He describes the colour of the surface as clove-brown, with spots of ochre-yellow, owing to the oxidation of the surface, which is covered with a crust of the brown hydrate of the peroxide. Within the colour is paler than the colour of newly filed bar iron, but not so pale as that of the Elbogen native iron.

A polished surface, etched with nitric acid, shows the characteristic damask-like delineations first observed by Widmannstetten. They are, however, slightly different from these in the delicacy and angular disposition of these figures. Those of Elbogen are usually thin and distinctly triangular, meeting at angles of 60 and 120 deg., whereas in those of Bohumilitz the lines are thicker, and meet at angles not always exactly the same; those of 70 and 110 deg., however, are more usually found. The whole appears to be a compound of several individuals, which may be distinctly seen, when slices are broken across, or in the fracture of the fragment, first detached by the blacksmith.

Cleavage may be distinctly traced in planes perpendicular to each other, which leads to the hexahedron as the fundamental form. They were obtained by cutting through the mass, but not entirely, and then breaking across the remainder; but, on ac-

* Millauer, Verhandlungen des böhmischen Museums, 1825. 3.

count of the great toughness of the substance, it is generally interrupted by the hackly fracture.

The mass is traversed by several cracks or fissures, and contains also imbedded nodules of a mixture of plumbago, magnetic iron pyrites, and a white metallic substance, not exactly ascertained. The latter, which occurs likewise in small grains disseminated in the Elbogen meteoric iron, occurs here in larger nodules, particularly in the places where the iron and the plumbago meet. Some of the nodules of the latter are nearly an inch in diameter.

Professor Steinmann found the specific gravity to be 7.146.

On dissolving the substance in muriatic acid, hydro-sulphuric acid was developed, which being introduced into a solution of acetate of lead, gave a small quantity of a precipitate of sulphuret of lead.

A small residue of 1.12 per cent. of the whole was left, which was insoluble even in nitro-muriatic acid. It proved to be a mixture of plumbago, and of small metallic scales of a steel-grey colour. The solution in muriatic acid being boiled with nitric acid, in order to bring the iron into the state of peroxide, was decomposed by carbonate of potassa, and the precipitate digested with caustic ammonia. The blue ammoniacal solution left gave a residue of 5.11 per cent. of oxide of nickel, by evaporation and subsequent ignition.

The result of the analysis of the Bohumilitz meteoric mass is therefore:

Iron - - - - - - - - -	94.06
Nickel, - - - - - - - - -	4.01
Plumbago, with another metallic substance not sufficiently ascertained, - - - -	1.12
Sulphur, - - - - - - - - -	0.81
	100.00

MINERAL KERMES.

The composition of mineral kermes, as determined by Berzelius and Rose, in accordance with Philips, has lately been called in question by the French chemists. According to the former chemists, it is exactly the same substance as the common native sulphuret of antimony. Robiquet, Buchner, and Henry Junior, who found it to contain oxide of antimony, have been joined by Gay-Lussac, who says, (*An. de Chim. et de Phys.* xlii. p. 87) that, when heated with hydrogen gas, it gives off water, and that it is in fact a compound of 1 atom oxide of antimony + 2 sulphuret of antimony. Rose has therefore repeated his experiments (Poggendorff's *Annalen*, xvii. 324.) with his former results. He prepared his kermes by boiling carbonate of soda on the common sulphuret of antimony, filtering, setting aside to cool, filtering again in half an hour to collect the precipitate, drying it well on

bibulous paper, and afterwards by a gentle heat till it ceased to lose weight. He found the kermes thus prepared to give no water in a current of hydrogen gas, but to leave 72.71 per cent. of metallic antimony. His former analysis gave 72.32 per cent. and Berzelius found in the common sulphuret 72.77 per cent. The residual liquid, according to Rose, after some hours, becomes troubled, and deposits a white sediment, being oxide of antimony combined with soda. If the kermes be not filtered soon after its deposition, it will thus be contaminated both with oxide of antimony and with alkali,—and this is probably the source of the oxide found by the French chemists. Since no carbonic acid is evolved during the preparation of the kermes by this process, all that takes place is a mere solution of the sulphuret of antimony in the carbonated alkalies.*

EFFECTS OF HEAT UPON COPPER ORES.

In an able paper on the mixed ores of copper, lead, and iron, by Bredberg, a very striking fact is mentioned in regard to the effects of heat upon the sulphuret of copper which they contain. A mass of the ore apparently homogeneous, and containing through its whole substance from four to five per cent. of copper by roasting, has its structure changed into a succession of layers. In one case cited there were two layers and a central ball. The outer layer had an earthy fracture, and contained only three per cent. of copper. The second layer had the metallic lustre of copper pyrites, and contained twenty per cent. of copper—the internal ball, which contained fourteen per cent. combined with an excess of sulphur. Part of the iron was oxidized, but the proportions of the other constituents in the other parts of the mineral were unchanged. If the roasting be longer continued, a greater portion of the mass will be decomposed, but in the interior will be found a smaller bronze-coloured ball, containing fifty-four per cent. of copper.†

PREPARATION OF PHOSPHORUS.

Wohler recommends, as likely to give phosphorus at a very cheap rate, to distil by a strong heat ivory black with half its weight of fine sand and charcoal powder. A silicate of lime is formed, and the carbonic oxide and phosphorus come over.‡

HYDRIODIC ETHER.

Serullas gives the following improved process for preparing this substance. Into a tubulated retort are introduced 40 gram. iodine and 100 alcohol of 38 deg. B. agitate and add 2.5 grains of phosphorus in small pieces. Distil nearly to dryness: add 25

* Brewster's Journ. † Kongl. Vetenskabs handling.
‡ Pog. An. de Phys.

or 30 grains alcohol, and distil again till nearly dry. Water throws down the ether from the solution. After washing, it is to be distilled from chloride of calcium.*

CHEMICAL COMPOSITION OF CHEESE.

By M. R. Brandes.

It results from Mr. Brandes' researches on the chemical composition of cheese, made in the farm-houses, that in 4 oz. there are as follows:—

1.	A gelatinous animal substance, or caseous matter somewhat modified by aposepedine (caseous oxide,) common salt, and phosphate of lime -	10 grains.
2.	Aposepedine - - - - - - - -	65
3.	Aposepedine combined with ammonia: an animal matter soluble in water and precipitable by the tincture of galls; acetate of ammonia; muriate of soda, and traces of phosphate and sulphate of soda - - - - - - - - -	379
4.	Sebacic acid and sebate of ammonia - - -	165
5.	Sebacic acid and oleic acid combined in part with ammonia - - - - - - -	15
6.	Aposepedine with ammonia and a gelatinous animal matter - - - - - - -	30
7.	More or less altered caseous matter, with sebate of lime, and traces of phosphate of lime -	165

The other parts contained in the cheese consist of water and seasoning, such as cummin-seed.

The principal mass of a well prepared cheese, then, consists of aposepedine combined with ammonia, of free aposepedine, of sebacic acid and sebate of ammonia, of a gelatinous animal matter, and of caseous matter more or less modified. In the caseous fermentation there is formed, besides aposepedine and the sebacic and oleic acids, a great quantity of ammonia, which combines with those acids, but which is partly dissipated when the mass is dried or heated. It is almost beyond doubt that aposepedine is formed at the expense of caseous matter; but we have less clear notions of the formation of sebacic acid, whose proportion is very great. M. Brandes remarks, that the composition of decayed and poisonous cheese has no appreciable difference from that of wholesome cheese: that sebacic acid cannot be considered as the poisonous principle, and that it consequently remains a subject for investigation to ascertain the difference between the two.†

SUPPOSED NEW VEGETO-ALKALI—CHINIOIDIA.

MM. Henry, jun. and Delondre have made numerous experiments to determine whether such an alkali really exists as that

* An. de Chim. † Archiv. der Apotheken-Vereins.

which Serturner has named Chinioïdia, and they have arrived at the following conclusions:—

1st. That there remains little doubt as to the non-existence of chinioïdia, and that it appears demonstrated that it is only a modification of quinia and cinchonia combined and rendered uncrystallizable by a peculiar yellow matter. These modifications cease, when after a long time and much care it is either separated or destroyed and crystallization takes place.

2nd. That the yellow resinous matter which accompanies quinia more than cinchonia, appears to change its properties much; this yellow matter the authors succeeded in destroying, but without being able to collect it separately in a perfect state. It appears to differ from the yellow colouring of the bark, which is fixed by alumina, oxide of lead, and of tin.

3rd. That this yellow matter especially influences the crystallizations.

4th. That the most certain method of clearing the mother waters from it, are the addition of turpentine, repeated precipitation and solutions in the acids, and concentration by cold.

The experiments were made by MM. Henry and Delondre, and always with the same results; they operated upon the mother waters remaining after the treatment about two hundred thousand pounds of yellow bark, and they always separated from this suspected matter the portion of quinia and cinchonia, the crystallization of which it had prevented.*

CURIOUS PHENOMENON OF REVOLVING MOTIONS, PRODUCED BY THE COMBINATION OF ALCOHOL WITH LAUREL OIL.

By Dr. Hancock.

To exhibit a singular spectacle which seems to bear some analogy with the motions of the planetary orbs, take a vial of laurel oil and drop into it, at different intervals, some rectified spirits of wine, when the most interesting results will be observed to ensue; a circulation presently commencing, of globules of alcohol up and down through the oil, which will last for many hours, or for days, (how long is unknown.) A revolving or circulating motion also appears in the oil, carrying the alcoholic globules through a series of mutual attractions and repulsions, the round bodies moving freely through the fluid, turning short in a small eccentric curve at each extremity of their course, passing each other rapidly without touching; but after a time, they seem to acquire a density approximating to that of the lower stratum, which appears to be an aqueous portion, separated by the ethereal oil from the alcohol; and this assimilation taking place, the globules, after performing many revolutions, will fall flat upon the surface, and unite with the lower or watery stratum.

* Journal de Pharmacie.

The orbits of those small globules being confined by the glass are very eccentric. In the course of the experiment. I observed particles of the fluid to separate in larger globular portions; these commenced a similar revolution, and smaller ones quitted their course and revolved about the larger, whilst the latter still pursued their course after the manner of primary planets and their secondaries. This, however, can only be well understood by seeing the experiment, which is easily performed, and well worth the trouble; as it appears to me, that, if attentively studied, it might furnish important deductions, and serve, we know not how far, towards an illustration of the celestial motions.

In the present case, the revolving motion of these globules appeared to be, not as we are accustomed to regard the planetary motions, as the effect of a direct attractive and repulsive power, in combination with a projectile force, but as revolving in a circulating medium, attended by an emanation from the globules themselves.

This experiment was performed with a small vial. Perhaps a larger one would render the result more perspicuous.*

POWER OF METALLIC RODS OR WIRES TO DECOMPOSE WATER AFTER THEIR CONNEXION WITH THE GALVANIC PILE IS BROKEN.

By Berzelius.

IN the experiments which I undertook in 1806-7, in company with Mr. Hisinger, we had found that rods of metal which were employed to decompose water by means of the galvanic pile continued to develope gas after their connexion with the pile had ceased,—a circumstance which seemed to indicate a continuance of electrical state, though these rods showed no action upon any other portion of liquid, even of the same kind, than that in which they had been placed during their contact with the pile. This observation which I had almost forgotten, has been lately confirmed by Pfaff, who has also added to it several others of a similar kind. We might suppose such effects to be produced by a residual polarity, both in the liquid and the metal, showing itself, as long as it continued, by a continuance of chemical action; but some of Pfaff's experiments seem to oppose this idea, for he found that the addition of ammonia to the liquid, by which all its internal polarity was destroyed, did not deprive the wires of their effect. The metals which acquire this property in the highest degree are zinc and iron, next to which is gold. He attempts to explain the phenomenon, by supposing that the continued passage of the electrical stream had brought the elements of the water nearer to a state of separation, so that a very slight influence was sufficient to destroy their union. It must be confessed, however, that we cannot at present advance a satisfactory explanation.

* Brewster's Journ.

DETECTION OF ALLOY IN SILVER BY THE MAGNETIC NEEDLE.

Oersted has made an ingenious and novel application of the magnetic multiplier. He finds that if a good electro-magnetic multiplier, with double needles, be suspended by a hair or a thread of unspun silk between two pieces of wrought silver, differing only one per cent. in the quantity of copper they contain, so sensible an effect is produced upon the needle as to render this a more accurate method of proof than the common touch-stones. Small trial plates are made of different degrees of purity, and the piece to be tried is compared with them in the following way: A thin piece of woollen cloth is dipped in muriatic acid, and laid upon the trial plate, after which the piece to be tried is brought into contact with the acid and the wire of the multiplier. The deviation of the needle shows which contains the most alloy, and another trial plate must be employed till the needle ceases to be affected, when both are of equal fineness In coming to a conclusion on this point, however, several circumstances are to be taken into consideration. Wrought silver goods are generally deprived of a portion of their copper by the action of acids, so as to render the surface finer than the inner part of the metal; the proof plates, therefore, must be prepared in the same way. Another source of error in the indications of the needle, are the unequal polish and size of the two pieces of metal; the latter of these is especially difficult to overcome when the surface of the metal to be proved is not plain. When, instead of muriatic acid, a dilute solution of caustic potash is employed, and the result is unlike, it is shown that copper is not the only alloy, but that brass is present; and the potash solution renders that which contains brass so positive, that it seems considerably purer than the trial plate. This is the case also in a very high degree when the alloyed metal contains arsenic, for example, when what is called white metal has been used for an alloy. This mode of proof is exceedingly interesting in a scientific point of view, and cases may occur in which it can be employed with advantage; but the sources of error can scarcely be ever so completely done away with as to make it a practical instrument in the hands of the silversmith, as Oersted seems to expect.*

BUCCINA—A NEW PRINCIPLE IN BOX-WOOD.

An apothecary of Bordeaux announced to the Pharmaceutical Society of Paris, at its last sitting, that he had discovered in the wood, and particularly in the bark, of the box-tree, an alkaline principle, to which he gives the name of buccina. It is in the form of powder, and neutralizes acids, forming uncrystallizable salts: it has a very strong sudorific action and bitter taste. M. Dupetit Thouars, in making this statement at the Philomathic

* From the German.

Society, remarked that buccina might perhaps be advantageously used in the manufacture of beer, "for there is more box-wood than hops employed in making almost all the beer brewed in Paris."*

METALLIC POISONS.

On Nov. 25th, a paper was read before the Royal Society, entitled, "On a simple electro-chemical method of ascertaining the presence of different metals; applied to detect minute quantities of metallic poisons." By Edmund Davy, Esq. F.R.S., M.R.I.A., and Professor of Chemistry to the Royal Dublin Society.

The Voltaic arrangement employed by the author consisted merely of small slips of different metals, generally zinc and platina, placed in contact and forming a galvanic circuit with the interposed fluid suspected to contain the poisonous metal; in which case, as was formerly shown by Sir H. Davy in his Bakerian lecture, the metal held in solution was deposited in the form of crystals, on the negative surface. The zinc was usually employed in the form of foil; the platina was, in some cases, a small crucible, or a spatula, but more frequently platina foil was used. It is generally necessary to mix a few drops of acid with the metallic compounds that are subjected to this test, and that are placed in contact with the platina: on applying the zinc foil, the platina will soon become coated with the reduced metal.

The author then enters into the detail of his experiments on the efficacy of his method in the detection of arsenic, mercury, lead and copper, in their different states of oxidation and saline combinations; and of the precautions necessary to be observed in the case of each metal. He was enabled to detect the presence of arsenic, by the exhibition of its characteristic properties, when only the 500th part of a grain of that metal was deposited on the platina; and in some instances could appreciate even the 2,500th part of a grain, by the application of appropriate tests.

The author next ascertained that the electro-chemical method is competent to the detection of very minute quantities of the different metals, when their compounds are mixed with various vegetable and animal substances. Thus, the presence of arsenic would readily be discovered when mixed with all the ordinary articles of diet, such as wheaten flour, bread, starch, rice, potatoes, peas, soup, sugar, vinegar, gruel, tea, milk, eggs, gelatine, and various kinds of wine; also when mixed with the principal secretions of the alimentary canal, as bile and saliva. Arsenious acid mixed with butter, lard and oils, or with sheep's blood, or ox bile, was detected with great ease. Similar results were afforded by corrosive sublimate, the acetate of lead, and sulphate of copper, added in small quantity to the most complicated mixtures of

* New Monthly Mag.

organic substances. 'In some instances where the common tests *do not act at all, or only act fallaciously, the electro-chemical* method acts with the greatest certainty.*

STATE OF MERCURY IN MERCURIAL OINTMENT.

By M. Mitscherlich.

THE mercurial ointment employed occupied four weeks in preparing; part of it was set to dissolve at a moderate temperature in alcohol containing caustic potash in solution. The mercury was separated in the metallic state and formed one globule at the bottom of the vessel; the solution was filtered, and the metal was carefully removed from beneath the filter; a white matter remained, which was not removed by washing, and which heated in a tube gave no metallic mercury, nor did it sublime.

From this experiment it appears that the ointment does not contain oxide but metallic mercury. To be certain whether by the reaction of the alcohol and potash the oxide had not been reduced, the following experiment was made: 1.101 gramme of protoxide of mercury was triturated for a long time with lard. The ointment thus prepared was subjected to alcohol mixed with potash as in the preceding experiment. The portion remaining undissolved had not the least appearance of metallic mercury; it weighed 1.196: submitted to distillation with muriatic acid, no metallic mercury appeared, but 1.29 gramme of protochloride of mercury, equivalent to 1.089 of protoxide of mercury. A small portion of the sediment when heated did not sublime.†

MR. BENNET'S NEW ALLOY FOR THE PIVOT HOLES OF WATCHES.

THE injurious effects of jewelled holes in watches and chronometers have been long observed. (See Nicholson's Journal, vol. vii. p. 208.) It seems that, however perfect the polishing may be, sooner or later the hard substance of the jewel grinds and cuts the steel pivot; and the metallic particles, by mixing with the oil, render it unfavourable for action; and this effect is the more likely to take place the nearer the pivots are to the maintaining power. Holes made of brass are objectionable, on account of the liability of this metal to oxidation. Gold is too soft for the purpose. What seems to be required is, a metal, that shall preserve the oil in a pure fluid state, have little friction with the steel pivot, and be in a small degree softer than the pivot, for it is of less consequence that the hole be worn than the pivot. Mr. Bennet, watch-maker, Red Lion-street, Holborn, in a pamphlet on this subject, states that he has discovered an alloy possessing the above-mentioned requisites. It is composed of 3 dwt. of pure gold, 1 dwt. 20 gr. of silver, 3 dwt. 20 gr. of copper, and 1 dwt.

* Philos. Mag. † Hensman's Repertoire.

of palladium. "The palladium," he says, "readily united with the other metals, and the alloy fused at a temperature rather below that required for melting gold in the separate state. It is very nearly as hard as wrought iron, and rather brittle, but not so brittle but that it can be drawn into wire. Its colour is a reddish brown; the grain, on breaking, as fine as that of steel; it takes a very beautiful polish; and the friction with steel was much less than that of brass and steel. It is better worked than any metal with which I am acquainted, except brass. Nitric acid had no sensible effect upon it." Mr. B. has constructed a watch with holes made of this alloy, and pronounces the experiment to be successful. If longer trial should confirm this opinion, the small expense of the metal, as compared to that of jewels, will not be its least recommendation.*

ALDINI'S INCOMBUSTIBLE DRESS FOR FIREMEN.

THE following is a more circumstantial account of the experiment with Aldini's dress than we were enabled to give last year.†

We shall proceed briefly to describe the experiments, which appear at least satisfactorily to establish the efficacy of the principle of M. Aldini's invention.

A fireman, with the double protection of the incombustible cloth and wire-gauze, subjected his face to the flame of a straw-fire held in a chafing-dish, for the space of one minute and thirty seconds. Another, armed as the former, with the addition of a sheet of amianthus in front, supported the heat during two minutes and thirty-seven seconds without any symptoms of suffering. The pulse of the first rose during the experiment, in the space of a minute, from 80 deg. to 120 deg., and that of the second from 72 deg. to 100 deg.

The next experiment was still more satisfactory. Two parallel hedges, about three feet distant from each other, were formed of straw and brushwood, piled upon bars of iron. When these were set on fire, the flames from the two rose in a body to the height of at least nine feet, and filled the entire space between; while the heat was too great to approach nearer than eight or ten paces. At this instant, six firemen, accoutred with the dress of M. Aldini, and following each other at a slow pace, traversed the flames between the hedges many times in succession. One of them carried an osier basket covered with wire-gauze, containing a child eight years old, protected only with a mask of incombustible cloth. This experiment, which the bystanders witnessed with apprehension, had a most satisfactory result; and had the smoke been more dense, it would have been entirely decisive. The firemen were unhurt; the one with the child retreated from the fire in the space of a minute, on account of the cries of the

* Philos. Mag. † See Arcana of Science for 1830, p. 25.

child, who was frightened at a sudden movement of the man in shifting it on his shoulder. The child was also uninjured, and when taken from the basket its pulse had risen only from 84 deg. to 98 deg. The other firemen sustained the experiment two minutes and twenty-two seconds; and on coming out, were in a profuse perspiration.

The pulse of the fireman who carried the child rose - - .	from 92 deg. to 116 deg.
That of the second - - - -	88 deg. to 152 deg.
That of the third - - - -	84 deg. to 138 deg.
That of the fourth - - - -	78 deg. to 124 deg.

The main question was, the possibility of supporting respiration in the midst of the flames: and if by this we suppose the men to be completely enveloped in them for two or three minutes, their situation certainly appears most perilous. M. Gay Lussac observes, that when a furnace is heated so as to flame and smoke, the air within is entirely deprived of oxygen; and therefore it is certain, that if the immediate action of the flames were guarded off by the wire-guaze, still it would be impossible to sustain respiration in the midst of them. We must therefore conclude that if the firemen did not experience the difficulty of breathing which we should naturally expect, they must have been supplied in some way with pure air. There are several ways of accounting for this; and one, which M. Gay Lussac suggests, appears the most probable: viz. that the men were supplied by a current of fresh air from the space between the two garments. Besides this, we cannot suppose that their heads were constantly enveloped in the flames, and they would, of course, find favourable moments for breathing; but the power of suspending the breath is also an excellent resource, which every fireman ought by practice to acquire. The fireman has another difficulty to contend with, in the dense volumes of smoke, which prevent his breathing, blind his sight, and consequently retard his exertions. To obviate this, it has been proposed to furnish a supply of air from a portable reservoir; or by means of a flexible tube, rising from the feet to the mouth, through which the fresh air would naturally rise, as the heated air escaped above.

There is little doubt that amianthus may easily be manufactured: M. Aldini has succeeded in weaving a stout cloth of it, nine feet five inches long, and five feet three inches wide, being nearly equal to the celebrated one preserved in the Vatican. But the cost of this material cannot admit of very general use, and on this account M. Aldini is endeavouring to substitute for it a manufacture of wool.

Wool is naturally but little inflammable, and when steeped in a solution of sal-ammoniac and borax, or alum, burns to a cinder without inflaming; it is also slowly penetrated by heat. It appears from an experiment of M. Flourens even to have an advantage over amianthus. That gentleman presented a finger

covered with amianthus-cloth to the flame of a wax candle, and afterwards repeated the experiment, substituting a covering of the prepared wool of the same thickness. In the first case he experienced the effect of the heat sooner than in the latter. In point of economy, facility of preparation, and convenience, from its greater lightness and weaker conducting power, the preparation of wool has the preference over amianthus: and though its resistance to fire is less than the latter, it is still sufficient in all ordinary cases, and may form a very sufficient substitute.*

OCCURRENCE OF IODINE AND BROMINE IN CERTAIN MINERAL WATERS OF SOUTH BRITAIN.

By Charles Daubeny, M. D. F. R S., Professor of Chemistry in the University of Oxford.

THE author lays claim to being the first who announced to the public the existence of bromine in the mineral springs of England: a discovery similar to that which had been previously made by others in many analagous situations on the continent. His reason for offering the present communication to the Royal Society is, that he has examined on the spot a great number of mineral springs, and endeavoured to obtain, wherever it was practicable, an approximation to the proportion which iodine and bromine bear to the other ingredients. He has also aimed at forming an estimate of their comparative frequency and abundance in the several rock-formations; an object of considerable interest in geology, as tending to identify the products of the ancient seas, in their most minute particulars, with those of the present ocean. The results of his inquiries are given in the form of a table, in which the springs, whose waters he examined, are classified according to the geological position of the strata whence they issue, and of which the several columns exhibit the total amount of their saline ingredients; the nature and proportion of each ingredient, as ascertained by former chemists, or by the author himself; and, lastly, where they contained either iodine or bromine the ratio these substances bear to the quantities of water, and likewise to the chlorine also present in the same spring. He finds that the proportion of iodine to chlorine varies in every possible degree; and that even springs which are most strongly impregnated with common salt, are those in which he could not detect the smallest trace of iodine. The same remark, he observes, applies also to bromine; whence he considers, that although these two principles may, perhaps, never be entirely absent where the muriates occur, yet their relative distribution is exceedingly unequal. The author conceives that these analyses will tend to throw some light on the connexion between the chemical constitution of mineral waters and their medicinal qualities.

* Philos. Mag.

Almost the only two brine springs, properly so called, which have acquired any reputation as medicinal agents, namely that of Kreutznach in the Palatinate, and that of Ashby-de-la-Zouch in Leicestershire, contain a much larger proportion than usual of bromine,—a substance, the poisonous quality of which was ascertained by its discoverer, Balard. The author conceives that these two recently found principles exist in mineral waters in combination with hydrogen, forming the hydriodic and hydrobomic acids, neutralized, in all probability, by magnesia, and constituting salts, which are decomposable at a low temperature. He has no doubt that a sufficient supply of bromine might be procured from our English brine springs, should it ever happen that a demand for this new substance were to arise.*

RADIATION OF HEAT.

On April 2, Mr. Ainger lectured at the Royal Institution, on the theory of the radiation of heat. Mr. Ainger's point was to explain a difficulty in M. Prevost's theory of the radiation of heat, dependent upon the manner in which surrounding objects frequently influenced the apparent quantity of radiation from a given central heated body, as a thermometer, in complicated and frequently unperceived ways. By taking into account the temperature of all these bodies, and the reflective as well as radiating power of such as were important, he showed that the difficulty really had no existence. He pointed out also by an experiment, that a given body with a constant temperature and surface might appear either hot or cold to the same thermometer according to the temperature of the surfaces, the rays from which would be intercepted by the body and prevented from impingeing on the thermometer.†

CHARRING OF WOOD AT LOW TEMPERATURES.

By R. Phillips, Esq.

Mr. Charles May, chemist of Ampthill, has sent me some specimens of wood converted into nearly perfect charcoal, at a very low but long continued heat. The pieces, he informs me, are part of the bottom of a tub, which held about 130 gallons, and which had been in use in his laboratory about three years and a half, and almost constantly worked for boiling a weak solution of common salt, generally with an open steam pipe, and sometimes, though rarely, with a coil: the temperature was seldom higher than 216 or 220 deg., and the vessel was lined with tin rolled into sheets about 1-16th of an inch thick, and nailed to the inside; the joints, however, were not so good as to prevent the liquid from getting between the metal and the wood. Mr. May

* Philos. Mag. † Ibid.

states also, that he had long since remarked, that on making extracts with steam of very moderate pressure, all the apparent effects of burning might be produced, but that he was not prepared to find so complete a carbonization of wood by steam; the vessel was made partly of fir and partly of ash, the former of which was most perfectly reduced to the state of charcoal.*

COMPOSITION OF GUNPOWDER.

Dr. Ure has analyzed various samples of gunpowder, and the following are the results of his investigation:

	Nitre.	Charcoal.	Sulphur.	Water.	Loss.
Waltham Abbey - -	74.5	14.4	10.0	1.1	
Hall, Dartford - - -	76.2	14.0	9.0	0.5	0.3
Pigou and Wilks - -	77.4	13.5	8.5	0.6	
Curtis and Harvey - -	76.7	12.5	9.0	1.1	0.7
Battle gunpowder - -	77.0	13.5	8.0	0.8	0.7

"The process," observes Dr. Ure, "most commonly practised in the analyses of gunpowder seems to be tolerably exact. The nitre is first separated by hot distilled water, evaporated and weighed. A minute loss of salt may be counted on from its known volatility with boiling water. I have evaporated always on a steam bath. It is probable that a small proportion of the lighter and looser constituent of gunpowder, the carbon, flies off in the operations of corning and dusting. Hence analysis may show a small deficit of charcoal below the synthetic proportions originally mixed. The residuum of charcoal and sulphur left on the double filter-paper being well dried by the heat of ordinary steam, is estimated as usual by the difference of weight of the inner and outer papers This residuum is cleared off into a platina capsule with a tooth-brush, and digested in a dilute solution of potash at a boiling temperature. Three parts of potash are fully sufficient to dissolve out one of sulphur. When the above solution is thrown on a filter, and washed first with a very dilute solution of potash boiling hot, then with boiling water, and afterwards dried, the carbon will remain; the weight of which deducted from that of the mixed powder will show the amount of sulphur."

Dr. Ure says that he has tried other and more direct modes of estimating the sulphur, but with little satisfaction; such as dissolving it by means of hot oil of turpentine, its conversion into sulphuric acid by the use of nitric acid and chlorine, &c.

"If we inquire," says Dr. Ure, "how the *maximum* gaseous volume is to be produced from the chemical reaction of the elements of nitre on charcoal and sulphur, we shall find it to be by the generation of carbonic oxide and sulphurous acid, with the

* Philos. Mag.

disengagement of nitrogen. This will lead us to the following proportions of these constituents:

1 prime equivalent of nitre	- - -	102	75.00	per cent.
1 do. do. sulphur	- -	16	11.77	
3 do. do. charcoal	- -	18	13.23	
		136	100.00	

The [acid of the] nitre contains five primes of oxygen, of which three, combining with the three of charcoal, will furnish three of carbonic acid gas, while the remaining two will convert the one prime of sulphur into sulphurous acid gas. The single prime of nitrogen is, therefore, in this view disengaged alone.

The gaseous volume, on this supposition, evolved from 136 grains of gunpowder, equivalent in bulk to 75 grains of water, or three-tenths of a cubic inch, will be, at the atmospheric temperature, as follows:

	Grains.		Cubic Inches.
Carbonic oxide - - - - - -	42	=	141.6
Sulphurous acid - - - - - -	32	=	47.2
Nitrogen - - - - - - - -	14	=	47.4

being an expansion of one volume into 787.3. But as the temperature of the gases at the instant of their combustive formation must be incandescent, this volume may be safely estimated at three times the above amount, or considerably upwards of two thousand times the bulk of the explosive solid."*

The English sporting gunpowders have long been an object of desire and emulation in France. Their great superiority for fowling-pieces, over the product of the French national manufactories, is indisputable. Unwilling to ascribe this superiority to any genuine cause, M. Vergnaud, Captain of French Artillery, in a little work on fulminating powders, lately published, asserts *positively*, that the English manufacturers of "poudre de chasse" are guilty of the "charlatanisme" of mixing fulminating mercury with it. To determine what truth was in this allegation, with regard at least to the above five celebrated gunpowders, I made the following experiments:

One grain of fulminating mercury, in crystalline particles, was mixed in water with 200 grains of the Waltham Abbey gunpowder, and the mixture was digested over a lamp with a very little muriatic acid. The filtered liquid gave manifest indications of the corrosive sublimate, into which fulminating mercury is instantly convertible by muriatic acid; for copper was quick-silvered by it; potash caused a white cloud in it, that became yellow, and sulphuretted hydrogen gas separated a dirty yellow-white precipitate of bisulphuret of mercury. When the Waltham Abbey powder was treated alone with dilute muriatic acid, no effect whatever was produced on the filtered liquid by the sulphuretted hydrogen gas.

* Journal of the Royal Institution.

Two hundred grains of each of the above sporting gunpowders were treated precisely in the same way, but no trace of mercury was obtained by the severest tests. Since, by this process, there is no doubt, but one 10,000th part of fulminating mercury could be detected, we may conclude that Captain Vergnaud's charge is groundless. The superiority of our sporting gunpowders is due to the same cause as the superiority of our cotton fabrics—the care of our manufacturers in selecting the best materials, and their skill in combining them.*

DECREPITATING COMMON SALT—CONDENSATION OF GAS IN IT.

M. Dumas has examined and described a very curious effect which occurred when some rock-salt, obtained from the mine of Wieliczka, in Poland, and given to him by M. Boué, was put into water. It decrepitated as it dissolved in water, and gradually evolved a sensible portion of gas. The bubbles of gas were sensibly larger when the decrepitations were stronger, and the latter frequently made the glass tremble. This salt owes its property of decrepitating to a gas, which it contains in a strongly-compressed state, although no cavities are sensible to the eye. When the experiment was made in perfect darkness no light was disengaged. The gas disengaged is hydrogen slightly carbonated; when mixed with air it burns by the approach of a light.

This disengagement of gas will assist in explaining the numerous accidents which have happened from fire-damp in salt mines. Several portions of the salt were nebulous, others were transparent. The nebulosities indicated the existence of numerous minute cavities, probably filled with condensed gas, and, in fact, a nebulous fragment, dissolved in water gave more gas than an equal-sized fragment of the transparent salt.

This new fact, described by M. Dumas, shows how frequent, in the course of geological accidents, are the phenomena which give rise to the accumulation of gas in the cavities of mineral substances, and how varied are the substances upon which these phenomena have been exerted. M. Dumas has endeavoured to reproduce salt having the power of decrepitating in water like that described.†

IMPROVEMENTS IN BLACK WRITING INK.

By John Bostock, M.D.‡

When the sulphate of iron, and the infusion of galls, are added together, for the purpose of forming ink, we may presume that the metallic salt or oxide enters into combination with at least

* Journ. of Royal Institution. † Revue Encyc.

‡ Chairman of the Committee of Chemistry, in the Society for the encouragement of Arts, Manufactures, and Commerce. This valuable article is extracted from the 47th Vol. of its Transactions.

four proximate vegetable principles—gallic acid, tan, mucilage, and extractive matter, all of which appear to enter into the composition of the soluble parts of the gall-nut. It has been generally supposed, that two of these, gallic acid and the tan, are more especially necessary to the constitution of ink; and hence it is considered, by our best systematic writers, to be essentially a tanno-gallate of iron. It has been also supposed that the peroxide of iron alone possesses the property of forming the black compound which constitutes ink, and that the substance of ink is rather mechanically suspended in the fluid than dissolved in it.

Ink, as it is usually prepared, is disposed to undergo certain changes, which considerably impair its value: of these the three following are the most important: its tendency to moulding, the liability of the black matter to separate from the fluid, the ink then becoming what is termed ropy; and its loss of colour, the black first changing to brown, and, at length, almost entirely disappearing.

Besides these, there are objects of minor importance to be attended to in the formation of ink. Its consistence should be such as to enable it to flow easily from the pen, without, on the one hand, its being so liquid as to blur the paper, or, on the other, so adhesive as to clog the pen, and to be long in drying. The shade of colour is also not to be disregarded; a black, approaching to blue, is more agreeable to the eye than a browner ink; and a degree of lustre, or glossiness, if compatible with the due consistence of the fluid, tends to render the characters more legible and beautiful.

With respect to the chemical constitution of ink, I may remark, that although, as usually prepared, it is a combination of the metallic salt or oxide, with all the four vegetable principles mentioned above; yet I am inclined to believe that the last three of them, so far from being essential, are the principal cause of the difficulty which we meet with in the formation of a perfect and durable ink. I endeavoured to prove this point by a series of experiments, of which the following is a brief abstract. Having prepared a cold infusion of galls, I allowed a portion of it to remain exposed to the atmosphere, in a shallow capsule, until it was covered with a thick stratum of mould; the mould was removed by filtration, and the proper proportion of sulphate of iron being added to the clear fluid, a compound was formed of a deep black colour, which showed no farther tendency to mould, and which remained for a long time without experiencing any alteration.

Another portion of the same infusion of galls had solution of isinglass added to it until it no longer produced a precipitate; by employing the sulphate of iron, a black compound was produced, which, although paler than that formed from the entire fluid, appeared to be a perfect and durable ink. Lastly, a portion of the infusion of galls was kept for some time at the boiling tem-

perature, by means of which a part of its contents became insoluble; this was removed by filtration, when, by the addition of the sulphate of iron, a very perfect and durable ink was produced. In the above three processes I conceive that a considerable part of the mucilage, the tan, and the extract, were respectively removed from the infusion, while the greater part of the gallic acid would be left in solution.

The three causes of deterioration in ink, the moulding, the precipitation of the black matter, and the loss of colour, as they are distinct operations, so we may presume that they depend on the operation of different proximate principles. It is probable that the moulding more particularly depends on the mucilage, and the precipitation on the extract, from the property which extractive matter possesses of forming insoluble compounds with metallic oxides. As to the operation of the tan, from its affinity for metallic salts, we may conjecture, that, in the first instance, it forms a triple compound with the gallic acid and the iron; and that, in consequence of the decomposition of the tan, this compound is afterwards destroyed. Owing to the difficulty, if not impossibility, of entirely depriving the infusion of galls of any one of its ingredients, without, in some degree, affecting the others, I was not able to obtain any results which can be regarded as decisive; but the general result of my experiments favours the above opinion, and leads me to conclude, that, in proportion as ink consists merely of the gallate of iron, it is less liable to decomposition, or to experience any kind of change.

The experiments to which I have alluded above, consisted in forming a standard infusion by macerating the powder of galls in five times its weight in water, and comparing this with other infusions, which had either been suffered to mould, from which the tan had been abstracted by gelatine, or which had been kept for some time at the boiling temperature; and by adding to each of these respectively, both the recent solution of the sulphate of iron, and a solution of it, which had been exposed for some time to the atmosphere. The nature of the black compound produced was examined by putting portions of it into cylindrical jars, and observing the changes which they experienced with respect either to the formation of mould, the deposition of their contents, or any change of colour. The fluids were also compared, by dropping portions of them upon white tissue paper, in which way both their colour and their consistence might be minutely ascertained. A third method was, to add together the respective infusions, and the solutions of the sulphate of iron, in a very diluted state, by which I was enabled to form a more correct comparison of the quantity, and of the state of the colouring matter, and of the degree of its solubility.

The practical conclusions that I think myself warranted in drawing from these experiments, are as follow:—In order to procure an ink which may be little disposed either to mould or to

deposit its contents, and which, at the same time, may possess a deep black colour, not liable to fade, the galls should be macerated for some hours in hot water, and the fluid be filtered; it should then be exposed for about fourteen days to a warm atmosphere, when, any mould which may have been produced, must be removed. A solution of sulphate of iron is to be employed, which has also been exposed for some time to the atmosphere, and which, consequently, contains a certain quantity of the red oxide of iron diffused through it. I should recommend the infusion of galls to be made of considerably greater strength than is generally directed; and I believe that an ink, formed in this manner, will not necessarily require the addition of any mucilaginous substance to render it of a proper consistence.

I have only further to add, that one of the best substances for diluting ink, if it be, in the first instance, too thick for use, or afterwards become so by evaporation, is a strong decoction of coffee, which appears in no respect to promote the decomposition of the ink, while it improves its colour, and gives it an additional lustre.

ATMOSPHERIC CARBONIC ACID.

M. Theod. De Saussure has made numerous experiments to determine the variations of carbonic acid in the atmosphere, and published them in the memoirs of the Physical and Natural History Society of Geneva. The following results are extracted from the *Bibliotheque Universelle* for June 1830:

The carbonic acid was absorbed by barytes water, and the carbonate precipitated was estimated to contain 22 per cent. of carbonic acid. The experiments were made at Chambeisy, about three quarters of a league distant from Geneva, and 16 metres above the level of the lake; 10,000 volumes of air contain 4.15 of carbonic acid, as the mean of 104 experiments made day and night and at all seasons of the year; the air was taken four feet above the ground; the greatest quantity of carbonic acid was 5.74, and the smallest 3.15.

An increased quantity of rain appears to diminish that of the carbonic acid, either by dissolving it or in causing the soil to do so; a litre of fresh rain water, which did not render lime-water turbid, gave in summer, by an hour's boiling, 20.5 cubic centimetres of air, which contained 13.46 of azote, 6.73 of oxygen, and 0.31 of carbonic acid: and it appears from a very elaborate set of experiments, that the quantity of carbonic acid is generally larger as that of the rain is smaller:—thus in June 1827, the quantity of rain was 9 millimetres, and that of the carbonic acid 5.18, in 10,000 of air; while in September 1829, the rain was 254 millimetres, and the carbonic acid only 3.57 volumes in 10,000 of air.

It was found that during the night the quantity of carbonic

acid was greater than that of the day in the proportion of 4.32 to 3.98; but if the wind be strong, then scarcely any difference occurs. The greater quantity of carbonic acid occurring in the night is attributed to the want of decomposition which occurs by vegetation during the day.

A short frost and which does not penetrate the earth to more than an inch, does not appear to cause any variation in the quantity of carbonic acid; but when the frost continues long, the dryness which it occasions increases the proportion. In the beginning of January 1829, the ground was lightly covered with snow, and the quantity of carbonic acid increased to 4.57; towards the end of the month it thawed for several days, and the acid was then reduced to 4.27. At the beginning of February the frost recommenced, and in the middle of the month the ground was frozen to the depth of eight inches; the carbonic acid rose to 4.52, it then thawed and the acid was reduced to 3.66.

The mean result of numerous experiments showed that the quantity of carbonic acid in 10,000 of air was less when taken over the lake of Geneva than at Chambeisy in the proportion of 4.39 to 4.60.

It was also found that the variations in the quantity of carbonic acid dependent upon season and night and day, occurred also in the air taken over the lake.

On comparing the quantity of carbonic acid found in the air of Geneva with that of Chambeisy, the former was found to be greater in the proportion of 4.68 to 4.37; these were the mean results of many experiments. It was also found that the quantity of carbonic acid is greater during day in the city than in the country, that the variations occasioned by the seasons are analogous, and that the quantity of carbonic acid increases more by the influence of night in the country than in the town.

On comparing the quantities of carbonic acid found in the air of the plains with that of the mountains, it was observed that the latter contained the most; this difference is explained by the consideration that the decomposition of the acid occurs principally where vegetation is most abundant, as it is in the plains, and that the gas is absorbed by the earth there, because it contains more rain-water. It appears also that the night has but little influence in increasing the carbonic acid of the mountain air.*

DR. URE ON INDIGO.

From the differences which exist in the nature and culture of the *indigofera*, and of its treatment by the manufacturer, the product, *indigo*, as found in commerce, differs remarkably in quality and chemical composition. In this respect, it forms a complete

* Phil. Mag.

contrast to the simple crystalline product sugar. Besides impurities accidentally present, from a bad season, want of skill or care, the purest commercial indigo consists of no less than five constituents—1. *Indigo-blue*, a very singular vegetable compound of carbon, hydrogen, and oxygen, with fully ten per cent. of azote; 2. *Indigo-gluten*, a yellow, or brownish-yellow varnish, which differs from wheat-gluten by its solubility in water. It has the taste of osmazome, or of beef-soup, melts when heated, burns with flame, and affords an empyreumatic oil along with ammonia by distillation.—3. *Indigo-brown*. This constituent is more abundant than the preceding. It is extracted by a concentrated water of potash, made to act on powdered indigo, previously digested in dilute sulphuric acid. Chevreuil's indigo-green seems to have consisted of this substance, mixed with some alkaline matter, and indigo-blue.—4. *Indigo-red*. This is readily dissolved by boiling alcohol out of indigo previously subjected to the action of an acid or alkaline menstruum. The alcohol acquires a beautiful red tinge, and leaves by its evaporation the red principle in the form of a blackish-brown varnish.—5. *Phosphate of lime*. I have found the bone phosphate in notable quantity in some fine indigo, constituting another feature of resemblance between this vegetable and animal products. Hence, also, the charcoal of indigo is most difficult of incineration, and requires, for perfect combustion in some cases, the deflagratory powers of nitric acid.*

FLUID IN THE CAVITIES OF ROCK SALT.

Dr. Nicol has examined certain samples of rock salt, which being clear, colourless, and transparent, exhibited small cavities in innumerable quantities, some of which contained a fluid, and others fluid with a bubble of air. Upon examining the fluid, it was found to differ from saturated solution of salt, and in fact to consist of a saturated solution of muriate of magnesia, mixed with a little muriate of lime; the salt which contains these cavities and fluids being itself perfectly free from magnesia and from chloride of sodium.†

ON SOME PROPERTIES OF SILVER.

M. Weslar states, that chloride of silver, blackened by light, is not a mixture of reduced silver and undecomposed chloride, but a sub-chloride of silver unattackable by nitric acid, though resolved by ammonia and a solution of common salt into metallic silver and chloride. It cannot be obtained pure by exposure of the chloride to light, but may by allowing silver to remain in a solution of muriate of copper or iron. When silver containing

* Quarterly Journ. † Jameson's Journ.

copper is blackened by solution of muriate of ammonia, it is in consequence of the formation of this chloride.

Silver left for a long time in strong solution of common salt is attacked; the liquid becomes weakly alkaline, and on evaporation yields crystals consisting of the combined chlorides of sodium and silver.

It is known that a hot solution of sulphate of iron dissolves silver, and that silver falls as the solution cools: but the metal is not totally precipitated, a part remains dissolved at common temperatures, and this is in greater proportion as the solution is more acid. Dilute sulphuric acid does not act on silver at common temperatures, but it is only necessary to add a drop of solution of sulphate of iron to make it do so. It appears that the oxygen of the air is conveyed to the silver by means of the solution of iron, the iron, after giving oxygen to the silver, retaking more from the air.

Solution of chloride of silver in common salt is not decomposed by potash, probably in consequence of the great affinity of the chlorine for silver, and the potassium for oxygen. It is owing to the same affinities that the complete decomposition of the chloride of sodium by oxide of silver can be effected.*

SUGAR FROM STARCH.

M. Heinrich says, that from one to two parts of sulphuric acid for each 100 parts of potato starch is sufficient, if the heat applied be a few degrees above 212 deg. Fahr.: and also, that then two or three hours are sufficient to give crystallizable sugar. He applies the heat in wooden vessels by means of steam.†

ANALYSIS OF MUSTARD-SEED.

By M. Pelouze.

Beaume, and after him MM. Deyeux and Thiberge, has stated the existence of sulphur in the essential oil of mustard. MM. Henry, jun. and Garot found among other principles a peculiar acid, which they called *sulpho-sinapic acid.*

After showing that the substance upon which these chemists operated, could not be pure on account of some atomic discordances in the compounds it is stated to have formed with various bases, M. Pelouze maintains that the acid is merely the hydrosulphocyanic existing in the state of sulphocyanuret of calcium: it appears, however, that the sulphur which the seed contains does not exist entirely in this state, but also uncombined; for when the seed is boiled with potash, acetate of lead shows the presence of sulphuret of potassium.

Hydrosulphocyanic acid (or rather sulphocyanic acid) may be

* Philos. Mag. † Brande's Journal.

obtained from the seed* by the direct action of dilute sulphuric acid upon strong decoctions of it, but the quantity is small. The following is given by M. Pelouze, as the composition of mustard seed:—

Volatile oil.	Yellow colouring matter.
Fixed oil.	Albumen.

Crystallizable white colouring matter.—Discovered by MM. Henry and Garot.

Bimalate of lime	Sulphocyanuret of calcium.
Citrate of lime.	Uncombined sulphur.*

ARSENIC.

As very incorrect notions prevail respecting the taste of arsenious acid, we extract Dr. Christison's remarks on this subject from his, "Treatise on Poisons," lately published. "It has long been almost universally believed to be acrid, and is described to be so in most systematic works, and in many express treatises: but in reality it has little or no taste at all. The reader will find some details on this point in a paper I published lately in the Edinburgh Medical and Surgical Journal. In the present work it is sufficient to observe, that I have repeatedly made the trial, and seen it made by my request by several of my scientific friends; and that after continuing the experiment as long and extending the poison as far back as we thought safe, we all agreed that it had hardly any taste at all,—perhaps towards the close a very faint sweetish taste. I have hitherto found only one authority who has made the observation that arsenic has no taste, namely Dr. Addington, the chief Crown witness on the trial of Miss Blandy; a few others, and more particularly Hahnemann, Dr. Gordon, and Mr. Walker, a witness on a late trial, have said that it is sweet; but all the other authors I have consulted mention that it is acrid, and one of these, Professor Fodere, even says that a grain causes an indescribable and insupportable metallic taste. It is impossible to make with safety satisfactory experiments on its taste, when it reaches the back of the palate; but we may rest assured that it often makes no impression at all, as it has been swallowed unknowingly with articles of food. This fact it is essential to remember, as many ignorantly believe that when swallowed, even in moderate quantity, it must cause a sense of acridity. I have not been able to find any actual case where this sensation was perceived; and it is therefore probable that the mistake, which the present remarks are intended to rectify, has arisen from the impression in the act of swallowing having been confounded with the inflammation in the throat subsequently developed along with the other inflammatory symptoms. And so Navier remarked, that the solution has at first a bland

* Annales de Chimie.

taste like milk, but in a few minutes excited a sense of roughness (*âpreté*), and soon after the usual effects of burning."

On the odour of arsenic as a test, we may extract the following comment. "This test should be altogether discarded. It does not always detect arsenic when present; and the alliaceous odour is not an infallible proof that it is present. Zinc powder projected on burning fuel emits the same odour. Phosphorus, phosphoric acid, and the phosphates give out a similar odour; and I have frequently remarked one very like it from burning paper. What is of more consequence, however, a very small portion of vegetable or animal matter, present in the matter subjected to trial, obscures the alliaceous smell entirely. This I have often observed, and the same thing was stated long ago by Pyl and Hahnemann. If any one should nevertheless wish to have recourse to this test, the proper way to try it, is to breathe gently with the nostrils into the tube immediately after the metal has been sublimed, and then to smell it."

In speaking of the detection of arsenic by means of the ammoniacal nitrate of silver, and of the obscurity occasioned by the presence of sea-salt, the following simple method is given for avoiding uncertainty arising from this source. "The best way of getting rid of this difficulty is to use in the first instance, not the ammoniacal nitrate, but the nitrate of silver as long as any white precipitate falls down, to add a slight excess of that test, and then, after subsidence, to drop in ammonia. No arsenic is thrown down by the first steps of this process; but if any be present, it is thrown down in the form of the rich yellow arsenite of silver, on the subsequent addition of ammonia. This very simple mode of getting rid of the chloride of sodium has been lately suggested by Dr. Forbes, Professor of Chemistry, Aberdeen." The same principle has been since applied by Dr. Christison, for removing animal substances, as preparatory to the precipitation of arsenic by sulphuretted hydrogen; a preparation which should never be omitted when much animal matter is present, as it is very apt to adhere to the sulphuret of arsenic, and prove troublesome in the process of reduction. This difficulty is avoided by adding nitrate of silver as long as any precipitate falls, when all the animal matter is thrown down in combination with oxide of silver, and arsenious acid remains in solution, provided care is taken that no uncombined alkali is present. The excess of silver is subsequently removed by muriate of soda, and the arsenic thrown down as usual by sulphuretted hydrogen. It is important, however, to neutralize the free nitric acid before transmitting sulphuretted hydrogen gas through the liquid; since otherwise the sulphuret of arsenic would be mixed with free sulphur, the presence of which renders the reduction by black flux both difficult and uncertain.

Much difference of opinion has prevailed regarding the influence of arsenic over the putrefaction of the bodies of persons

who have been poisoned with it. Till lately the prevailing opinion was, that the putrefactive process is accelerated; and in some instances this really appears to have been the case. But others maintain that arsenic sometimes proves powerfully antiseptic; and several remarkable cases, in proof of this opinion, are quoted by Dr. Christison from German writers, by whom the subject has of late been much dicussed. That arsenic acts as an antiseptic on the parts with which it is in contact, is clearly established by the following evidence:—

"Arsenic is a good preservative of animal textures when it is directly applied to them in sufficient quantity. This is well known to stuffers of birds and beasts, was experimentally ascertained by Guyton Morveau, and has also come under my own observation. I have kept a bit of an ox's stomach four years in a solution of arsenic, and, except slight shrivelling and whitening, I could not observe any change produced in it."

"Dr. Kelch of Konigsberg, buried the internal organs of a man who had died of arsenic, and whose body had remained without burial till the external parts had begun to decay; and on examining the stomach and intestines five months after, he found that the hamper in which they were contained was very rotten; but that 'they had a peculiar smell, quite different from that of putrid bowels, were not yet acted on by putrefaction, but as fresh as when first taken from the body, and might have served to make preparations. They had lost nothing of their colour, glimmer, or firmness. The inflamed spots on the stomach had not disappeared; and the small intestines also showed in some places the inflammatory redness unaltered.'"

"In the case of the girl Warden, which has been several times alluded to, the internal organs were also preserved somewhat in the same manner. The body had been buried three weeks; yet the mucous coat of the stomach and intestines, except on its mere surface, was very firm, and all the morbid appearances were consequently quite distinct. Nay, three weeks after disinterment, except that the vascularity had disappeared, the membranes and the appearances in them remained in the same state. A similar case has been recorded by Metzger. It is that of an old man who died after six hours' illness, and in whose stomach three drachms of arsenic were found. The body had been kept ten days in February before burial, and was disinterred eight days after that; yet there was not the slightest sign of putrefaction anywhere. A parallel case was described by myself in the Edinburgh Medico-Chirurgical Transactions."

In a case of poisoning with arsenic examined by Dr. Borges, Medical Inspector at Minden, fourteen weeks after death, "the stomach and intestines were firm, of a greyish-white colour, and contained evident crumbs of bread, while all the other organs in the belly were pulpy, and the external parts adipocirous." So also in a case which happened at Chemnitz in 1726, "the skin

was everywhere very putrid, but the stomach and intestines were perfectly fresh. In the case of Warden, the appearances were precisely the same. Three weeks after burial the Dundee inspectors found the external parts much decayed; and three weeks later, the stomach and intestines were found by myself in a state of almost perfect preservation. A striking experiment performed by Dr. Borges on a rabbit will likewise illustrate admirably the fact now under consideration. The rabbit was killed in less than a day with ten grains of arsenic, and its body was buried for thirteen months in a moist place under the eaves of a house. At the end of this period it was found that the skin, muscles, cellular tissue, ligaments, and all the viscera, except the alimentary canal, had disappeared, without leaving a trace; but the alimentary canal, from the throat to the anus, along with the hair and the bare bones, was quite entire."

But it is also maintained by some German writers that the preservative influence of arsenic is not confined to the parts actually in contact with it, but sometimes extends to the whole body; and Dr. Christison has quoted instances of the whole body in animals poisoned with arsenic, manifesting an unusually small tendency to decay. But this point is not decided. The facts already mentioned show that the body often decays as usual, while the parts to which arsenic had been actually applied are preserved; nor are those cases, in which the whole body remained entire, sufficiently numerous to prove that the preservation was really produced by arsenic, and not by accidental extraneous causes. Dr. Christison closes his account of the subject with the following remarks:—"Whatever credit is given to the opinion of the German medical jurists, in favour of the preservative power of arsenic, the English medical jurist will not lose sight of the fact, that in many instances the body in this kind of poisoning has been found long after death in so perfect a state as to admit of an accurate medico legal inspection, and a successful chemical analysis. In one of his cases Dr. Bachmann detected arsenic in the stomach fourteen months after interment; and Dr. Borges had no difficulty in detecting it in an animal after thirteen months.*

URINARY CALCULI

On March 12, at the Royal Institution Mr. Brande gave an account of the composition of Urinary calculi, and particularly of Dr. Wollaston's discoveries in that branch of chemistry. He did this, he said, because he was fully convinced that, if timely attention were paid to the attacks of sand and gravel in their early stages, many persons would be saved from the dreadful attacks of stone, and the evil cured before it had become unmanageable.

After stating what had been done before Dr. Wollaston's

* Philos. Mag.

time, and then what had been effected by him, Marcet, Prout, and others, he referred at last to the cases of Siliceous calculi, and stated that some new matter had been added to the subject lately, on this point, by Dr. Yelloly; but as we understand Dr. Yelloly's paper will come before the Royal Society, we shall probably have occasion to notice it more minutely hereafter.*

ACTION OF METALS ON WATER AND CARBONIC ACID, &c.

M. Despretz has stated to the French Academy, that nickel, cobalt, zinc, and tin, possess, like iron, the property of decomposing water at a red heat, and that their oxides are reduced by hydrogen at the same temperature; he has also observed that carbonic acid is converted by zinc and tin into oxide of carbon, and that this gas completely reduces the oxides of these metals. Thus a fact, which was considered as anomalous, extends to several metals and binary compounds.†

SPONTANEOUS PURIFICATION OF THAMES WATER.

By John Bostock, M.D. F.R.S. &c.

We extract the following very important paper, from the *Philosophical Transactions* for 1829, Part ii.

In the report respecting the analysis of the water of the Thames, which I presented, in April 1828, to the Commissioners appointed by His Majesty to inquire into the supply of water in the metropolis, I have stated that when the experiments were nearly brought to a close, a quantity of water was sent to me, purporting to have been "taken in the river, in the current of, and immediately at the mouth of the King's Scholars' Pond sewer." I described it as "in a state of extreme impurity, opaque with filth, and exhaling a highly fœtid odour." When it had been about a week in my possession, a considerable quantity of black water subsided from it, but the fluid was still dark-coloured and opaque, and nearly as offensive as at first, while the odour and colour were only in part removed by being passed through a layer of sand and charcoal six inches in thickness.

The water remained for some time in my laboratory without being attended to; when, after an interval of some weeks, I observed that a great change had taken place in its appearance. It was become much clearer, whilst nearly the whole of the sediment had risen to the surface, where it formed a pretty regular stratum of about half an inch in thickness; the odour, however, still continued extremely offensive, perhaps even more so than at first. From this time the process of depuration, which had thus spontaneously commenced, was continued for about eight weeks, when the water became perfectly transparent, without any unpleasant odour, although still retaining somewhat of its original dingy colour.

After the formation of the scum mentioned above, the next change that I observed was its separation into large masses or flakes? to these, as well as to the scum itself, a number of minute air bubbles were attached,

* Philos. Mag. † Le Globe.

to which, no doubt, they owed their buoyancy: after some time the masses again subsided, leaving the fluid almost totally free from any visible extraneous matter. The quantity of gas discharged was inconsiderable, so that it was difficult to obtain any of it for examination. It seemed to be principally composed of carbonic acid, containing a little sulphuretted, and perhaps carburetted, hydrogen gas.

When the process of depuration appeared to be complete, the water was filtered through paper, and was then subjected to the same mode of analysis which was employed on the former occasion. It was now perfectly transparent, and without taste or odour, but still retaining a slight brown tinge. It sparkled when agitated or poured from one vessel to another, and by boiling, a quantity of gas was disengaged from it: at the same time a thin film of carbonate of lime formed on the surface, which gradually subsided: 10,000 grains left by evaporation a saline crust of a light brown colour, which, after being thoroughly dried, weighed 7.6 grains. By the appropriate tests, the water was found to contain lime, sulphuric acid, muriatic acid, and magnesia. There was a trace of alu[illegible], and an indication of potash; but no ammonia, sulphur, or iron could be detected. The lime, the magnesia, and the sulphuric and muriatic acids were all of them obviously in much greater quantity than in the specimens of the Thames water previously examined. If we suppose the sulphuric acid to be combined with a part of the lime, and the remainder of the lime to be in the state of carbonate, and that a part of the muriatic acid is combined with the magnesia and the remainder with soda, as was conceived to be the case in the Thames water generally, the respective quantities of these salts in 10,000 grains will be as follows:

	grs.	grs.	
Carbonate of lime	4.20	1.55	Salts contained in the Lambeth water, which was considered as the most impure of the specimens formerly examined.
Sulphate of ditto	.66	.12	
Muriate of soda Muriate of magnesia	2.74	.23	
	7.60	1.90	

The result of this analysis shows, that although the water has, by this depurating process, freed itself from the great quantity of organic matter which it contained, and acquired a state of apparent purity, which might render it sufficiently proper for many purposes, yet that the quantity of saline matter is increased as much as fourfold. The greatest proportionate increase is in the muriates, which are very nearly twelve times more in the purified water than in the Thames water in its ordinary state. The carbonate of lime is between two and three times as abundant as before, and the sulphate of lime between five and six times. I may remark, that this water, when examined in its foul state, gave very obvious indications of both sulphur and ammonia, neither of which could be detected after depuration.

This depurating process may be denominated a species of fermentation; *i. e.* an operation, where a substance, without any addition, undergoes a change in the arrangement of its component parts, and a new compound or compounds are produced. The newly formed compounds were, in this case, entirely gaseous, and, except a part of the carbonic acid, were discharged. The saline bodies, being not affected by this process, remained in solution, leaving the fluid free indeed from what are considered as impurities, yet so much loaded with earthy and neutral

salts as to be converted from a soft into a hard water.* The source of the saline bodies may be supposed to be the organic substances, principally of an animal origin, which are so copiously deposited in the Thames; of these the most abundant are the excrementitious matters as well as the parts of various undecomposed animal bodies. The different species of the softer and more soluble animal compounds act as the ferment, and are themselves destroyed, while the salts which were attached to them are left behind. It may be conceived therefore, that the more foul is the water, the more complete will be the subsequent process of depuration; and we have hence an explanation of the popular opinion, that the Thames water is peculiarly valuable for sea stores, its extreme impurity inducing the fermentative process, and thus removing from it all those substances which can cause it to undergo any further alteration.

The brown colour which the water exhibited after its depuration appeared to depend on the solution of a minute quantity of what is generally termed extractive matter, and which is observed in water that contains decayed vegetable substances; it is almost always present in the beginning of winter in the water of ponds, or of slow streams that have received the falling leaves. After the heavy rains that occurred in December 1827, the New River water with which my cistern is supplied, was observed to be very turbid and dark-coloured. By remaining some hours at rest, a quantity of earthy matter subsided, and left the water nearly transparent, but the dark colour still continued†.

I found that this colouring matter was not removed by boiling, nor by filtration through sand and charcoal, but that alum and certain metallic salts, especially when heated with it threw down a precipitate, and left the water without colour. Of the metallic salts the most effectual appeared to be the sulphate of iron; a drop of the solution of this salt, boiled with 500 times its bulk of the water, threw down a flocculent, orange-coloured precipitate, and left the water perfectly colourless. I obtained the same results, only much less in degree, when these re-agents were added to the Thames water after its depuration.

The sediment which was removed from the water by filtration, as mentioned above, appeared to be a heterogeneous mass of various substances, about 9-10ths of which was siliceous sand; it also contained a black matter, which gave the whole a dark gray colour, and which was removed by a red heat; a number of fine fibres that looked like animal down; and some large fibres that were probably of vegetable origin; there were also bits of wood, fragments of coal, and small shining particles of a metallic nature, which seemed to be sulphuret of iron. The mass indeed consisted of all those substances which were casually introduced into the Thames, and which had not been decomposed by the fermentative process. They must of course differ, both in quantity and in quality, in every different portion of the water, so as to render it unnecessary to

* The terms hard and soft, as applied to water, are obviously relative; but water which contains as much as 5 grains in the pint of saline matter, is generally regarded as too hard for many economical and manufacturing processes. The water in question contained 4.36 grains per pint.

† It is not easy to institute any exact comparative scale of the shades of brown. An infusion formed by digesting, for 10 days, powdered galls in twenty times their weight of water, and afterwards diluting the infusion with an equal bulk of water, will exhibit a colour nearly similar to that of the New River water in the state in which I examined it.

attempt a more minute examination of them: in the present instance, the sediment, when completely dried at a temperature of 200 deg., was in the proportion of about 9 grains in 10,000 grains of the water.

INTENSITIES OF LIGHT.

On March 19, at the Royal Institution, Mr. Ritchie, gave an account of the methods proposed for measuring the intensities of natural and artificial light. He referred to the methods of Bouguer, Leslie, Rumford, and others; and amongst the rest to that upon which his own photometer is founded. This and the other instruments are known to the public. Mr. Ritchie's appears to be a very accurate and convenient instrument in numerous cases. By means of it the light of an Argand oil lamp and a gas lamp were compared; also the light of the Argand lamp and wax candles. The light of phosphorous burning in oxygen gas was compared to the light of the candle and lamp; and also a comparison made of the light of a wax-candle with that of the ball of lime ignited by the oxyhydrogen flame, as in Lieut. Drummond's application. Mr. Ritchie proposes to ascertain these numbers very accurately, and give the results to the public.*

THE VOLTAIC PILE.

In a statement of the progress of Chemical Science for 1829, by Berzelius, his most important remarks are in reference to the papers of De la Rive in the 37th and 39th volumes of the *Annales de Chimie*, on the developement of electricity in the pile. In these papers De la Rive has shown, by a series of ingenious and admirably conducted experiments, that the electrical theory, or theory of contact advanced by Volta, cannot be the true theory of the galvanic pile; and embracing, therefore, the other, the chemical theory, he endeavours by the aid of it to explain all the phenomena he has observed, while, *vice versa*, he contends that these experiments prove the chemical theory. His investigations, in short, are not made in search of a true theory, but assuming one of the two received theories to be true, his experiments, and many of them are exceedingly interesting, and devised with much skill and judgment, are intended to show the chemical to be the true one. This latter theory, indeed, is the simpler, and that which has the easiest and more *visible* proof on its side, and which, from the zeal of its advocates, is at present making the greater way. Still there are some few phenomena which it fails satisfactorily to account for, and which have led some philosophers, without rejecting the great influence of chemical action, to refuse it the sole agency in the developement of galvanic electricity. Among these is Berzelius. Though

* Phil. Mag.

in his treatise upon the "*Theory of the Electrical Pile*," published in 1807, he advocated the chemical theory, yet later experiments have convinced him, that, however intimate may be the connexion of chemical action with the phenomena of galvanism, yet that they have not their origin in this action, or at least cannot in all cases be accounted for without the co-operation of the conducting power supposed in the electric theory. To such of our readers as take an interest in these theoretical discussions, we would recommend a reference to the first part of Berzelius's Chemistry, where they are shortly discussed with the author's usual sagacity.

Heat.—Passing on to the subject of heat, we have an account of some researches of Svanberg into the heat of the planetary space. It is known that Fourier, in his valuable researches into this subject, deduced from the laws of radiant heat that the temperature of the planetary space is — 50° Cent. = 58 Fahr., and that the earth has nearly reached its limit of cooling. Svanberg has built his researches upon a different principle, and has obtained the same result. From his letter to Berzelius on the subject, we extract the following:—"Led by these considerations, and by the many known affinities between light and heat, which are especially remarkable in the acknowledged property of solar light to develope heat in opaque and imperfectly transparent bodies, I began by supposing that the planetary space (considered as perfectly pellucid) never undergoes any change of temperature either from the action of light or of radiant caloric, and that, therefore, the capacity for elevation of temperature above what reigns in the ethereal regions, can exist only within the limits of the planetary atmosphere. Further, that the rapidity of the change of temperature at an indefinite height above the surface of the earth, is always proportional to the rapidity of the atmosphere's corresponding change of capacity to absorb light. In this way I obtained the temperature of the atmosphere, (expressed in a function of an indefinite height above the earth's surface) containing only two arbitrary constants, of which the one is also a function of the time, and is determined always by immediate observation of the given temperature at the moment on the earth's surface; the other, namely the temperature of the planetary space, is constant, even in regard to the time.

Vegetable Chemistry.—Animal and vegetable chemistry afford to the man of science the most astonishing field of contemplation. He sees all the varieties of vegetable nature reducible to four elements, and animal products in general made up of the same number, and yet there is no end to their combinations, and none can tell the limits within which the changes of nature wrought through the aid of such scanty materials must be confined. Yet this beautiful simplicity has hitherto rendered the study of her combinations perplexing, and we have been unable often to discover such differences in atomic constitution as at all

to account for the diversities in external appearance and character of many vegetable and animal substances. But our knowledge is enlarging, and, as the resources of organic analysis become greater, it is to be hoped that we shall by degrees attain, if not to a complete, at least to a much less imperfect view of the chemical constitution of organized bodies than we can yet boast of.

The new researches under the head of vegetable chemistry most deserving of attention in the volume before us, are the *Equisetic acid*, found by the industrious Braconnot in the *Equisetum fluviatile*—an acid discovered by Runge in the *Scabiosa succisa*, which he calls *green* acid—a vegetable salt basis, found by Brandes in the *Chiococca racemosa*—another vegetable alkali named *Atropin*, extracted from the *Atropa Belladonna* by Ranque and Simonin—a third, by Dana, in the root of the *Sanguinaria Canadensis*, which he calls *Sanguinarin*—a fourth, by Pelletier, from the bark of a species of *Cinchona*, called *China de Calysaya* or *China de Carthagena*—a fifth, *Salicin*, prepared by Buchner from the bark of the *Salix pentandra*—and a sixth, which is the most remarkable of them all, being deliquescent, extracted by Boussingault from a substance called *Curara*, sold in South America for poisoning hunting spears, and which, according to Humboldt, is prepared from the juice of a tree analogous to the *Strychni*. Of substances possessing neither alkaline nor acid properties, Bonastre has discovered one peculiar to the wax of *Ceroxylon andicola*, a crystalline fatty matter, which he has called *Ceroxylin*—another, in the *Conium maculatum* by Brandes and Giesecke, half-a-grain of which kills a dog with the same symptoms as *Strychnin*, and which has been called *Coniin*—a third, by Dulong d'Astofort, in the *Plumbago Europæa*, named *Plumbagin*—a fourth, *Hesperidin*, by Lebreton in unripe pomegranates—and a fifth, *Tremellin*, by Brandes in the *Tremella mesenterica*, and which bears to it the same relation as *fungin* to the mushroom tribe.*

EFFECTS OF OXYGEN UPON THE ANIMAL SYSTEM.

THE first number of *Brande's Journal* for the past year contains an important "Inquiry into the Physiological Effects of Oxygen and other Gases upon the Animal System." By S. D. Broughton, F.R.S., Member of the College of Surgeons, &c. The paper occupies 20 pages, and is too long for insertion here. Mr. Broughton's results of the examination of oxygen are, however summed up as follow:

Without quoting particular authorities any farther, I find it is generally observable that some circumstances of a physiological nature have been apparently overlooked in trying the effects of

* Brewster's Journ.

oxygen upon the animal functions; while the chemical phenomena have been more fully investigated, and especially by the recent researches of Messrs. Allen and Pepys, leaving no points, perhaps, upon this ground incompletely treated. From the constancy of the most important facts in my experiments, I am inclined to think tkat I am justified in believing many of the results, arrived at by others, to be unsatisfactory hitherto; and their occasional apparent contradiction of each other strengthens this notion.

We may refer to the invariable manner in which animals, after remaining some time unaffected by breathing pure oxygen, begin to be excited, and their respiration and sanguineous circulation become greatly increased; and to the gradual state of debility and subsequent insensibility following, with loss of voluntary motion, and the cessation of the diaphragm's contracting long before the heart ceases to act with vigour, and to urge the blood through the vessels. When we refer to these phenomena, and find, also, that the renewal of an atmospheric circulation of air through the lungs is capable of completely restoring animation, we appear to be presented with a train of circumstances strikingly analogous to those which accompany the absorption of certain poisons into the blood.

The facts, of which I do not find mention made elsewhere, and which induce this analogous assumption, are the phenomena described as arising during the respiration of oxygen:—such as— the universal appearance of arterial blood; the gradual cessation of sensibility and voluntary motion; the long-continued breathing only by a slow and feeble action of the diaphragm; the full continuance of the heart's pulsations, circulating nothing but arterial blood, after the diaphragm has become still; the restoration of sensibility and voluntary power by atmospheric inflation; and the maintenance of animal heat within the body during the immersion in oxygen.

These appear to me to be circumstances well worthy of consideration, and necessary to be taken into account, when the influence of pure oxygen upon the animal functions is the object of our inquiry. And, in reference to these circumstances detailed, perhaps the following positions may be deemed satifactorily established—some of which are corroborated by the experience of others.

1. Animals immersed in equal quantities of atmospheric air and of pure oxygen, separately, live during different periods; those in the former dying sooner than those in the latter air.

2. The gas remaining after atmospheric respiration, contains carbonic acid in excess, sufficient instantly to extinguish a lighted taper, and to destroy animal life in a few seconds.

3. The gas remaining, after the respiration of pure oxygen, re-illuminates a blown-out taper, and sustains animal life, during variable periods, as in the first instance of immersion.

4. The gas of pure oxygen is not much deteriorated by the respiration of animals; while that of the atmospheric compound is rendered wholly unfit to sustain life and flame.

5. The tendency of an excess of oxygen is to increase the action of the pulmonic and aortic circulation, in the first instance, and to produce direct debility, insensibility, and loss of voluntary power in the second, involuntary action continuing indefinitely.

6. The invasion of the symptoms from breathing oxygen does not generally occur in less time than about an hour; and the sensibility of the animal is not uniformly affected at the same period.

7. The invasion of the symptoms seems to depend much upon the size, strength, and age of the animal employed.

8. Death is ultimately the constant result of breathing oxygen, pure or in excess.

9. If the motion of the diaphragm has not entirely ceased more than about two or three minutes, animation may be restored by atmospheric inflation of the lungs; and, as the blood acquires free access to common air, the functions of the brain are renewed.

10. The contractility of the heart and intestinal canal is retained long after the functions of the brain have ceased, or when sensibility, voluntary motion, and the action of the diaphragm, no longer exist.

11. Animals, having breathed oxygen during a certain time, circulate no venous blood in any part of the body: the whole mass throughout being of the brightest, transparent, arterial colour.

12. Animal heat is kept up, during the whole period of immersion in oxygen, above the ordinary temperature of the surrounding media, though apparently a few degrees lower than the usual degree of the animal.

13. Quick coagulation of the blood takes place, after death, from the respiration of oxygen.

MANUFACTURE OF CHARCOAL.

A NEW process, recommended in the *Journal des Forêts*, for this purpose, is to fill all the interstices in the heap of wood to be charred with powdered charcoal. The product obtained is equal, in every respect, to cylinder charcoal; and, independent of its quality, the quantity obtained is very much greater than that obtained by the ordinary method. The charcoal used to fill the interstices is that left on the earth after a previous burning. The effect is produced by preventing much of the access of air which occurs in the ordinary method. The volume of charcoal is increased a tenth, and its weight a fifth.*

Mr. Doolittle, of Birmington, United States, has lately charred wood in kilns constructed for the purpose with equal advantage. One was built of brickwork, thirty feet diameter and nine feet high, to the opening of the arch which inclosed the top. It had openings at the top and sides for the purpose of admitting air, charging, extracting, &c., all which openings were under regulation.†

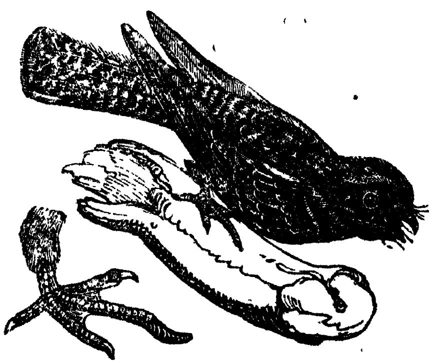
* Bull. Univ. † Silliman's Journ.

NATURAL HISTORY.

THE FERN OWL.

By Bartholomew Dillon, Esq., in a Letter to the Magazine of Natural History.

I am convinced there is no circumstance connected with the exposition of the history of any animal that you will consider unimportant; and, since the time of Mr. White of Selborne, there has not been, that I am aware of, any new fact, except one, added to his history of the fern owl. His account, certainly an interesting one, is that which all of our subsequent naturalists have, perhaps too lazily, adopted; and, seemingly without any further investigation, as if the subject were already exhausted, have so fully contented themselves with its acceptation, that they have not even attempted to perfect the suppositive part of his narration. It is in favour of Mr. Selby I would make the exemplary exception adverted to; for, as far as I know, he was the first to announce that "the bristles lining the edge of the upper mandible are capable of diverging or contracting, by means of muscles attached to their roots." The peculiar haunts and habits of the bird must not, however, be forgotten, as they are such as render fair opportunities of close observation very infrequent.



The points to which I am, at present, desirous of drawing attention, are the length of the tarsus, the structure of the foot, and the use of the middle claw—the serrated one.

The tarsus is *short*, comparatively, *very* short; in this circumstance closely resembling, but shorter than, the cuckoo's.

The toes are four in number; three anterior, and one usually denominated the *hind* toe, but which really is not so, being situated *laterally*, or as a man's thumb. It is very well known that the bird is not, strictly speaking, a *percher;* that he never sits *across* a twig; but whenever observed in a tree is always seen resting *longways* of a branch, and with his head *lowermost*, as I conceive, the better to destroy his insect prey, while on the alert. In Mr. Bewick's otherwise accurate figure, the bird is shown in a perching attitude, and thus at variance with his own description; he has also drawn the foot with a *hind* toe, rather than a *lateral* one: and precisely the same things may be said of the figure and description in Graves's *Ornithology;* but the foot of his bird is very ill represented. The artists, probably, conceived it necessary to exercise, what they considered, in these cases, a harmless liberty of sacrificing *truth* to *effect;* just as the elephant is always drawn, and even by Bishop Heber himself, who was yet aware of the fact, that the animal's motion is very different from that of the horse, as the elephant moves both feet on the same side at once. (See his Journal 4to. edition, p. 29, and plate, "Travellers and Peasantry in the Kingdom of Oude," facing p. 341, vol. i.)

It will now appear sufficiently obvious, that the particular posture of the bird has reference to his immediate convenience, and, in fact, that it is the natural and only comfortable one in which the bird could remain in such a situation, by reason of the foot being so adapted by an express provision in its structure.

Of the three anterior toes, the *middle one* is the longest, and, in comparison with the others, *very* long, say disproportionately so. The middle toe is also provided with a claw differing from all the rest; it is somewhat flat, slightly curvilinear outwards, and serrated on the concave edge, something like a sickle placed flatways with its point outwards. In the introduction to Bewick's *British Birds*, edit. 6. p. xxxvii., there is a figure of the *right* foot, which is quite correct in every particular, except the serrated claw, and that is represented as bending downwards like the other claws. Here the *lateral toe* is very intelligibly shown.

I consider the foregoing remarks in a great degree necessary to enable us to conduct the remaining inquiry with clearness and advantage. And now, what is the use of the middle claw?

Mr. White says, there is no bird whose manners he had studied more, than those of the Caprimulgus; and on the 12th of July, 1771, he had a fair opportunity of contemplating the motions of one as it was playing (or, as I suspect, hawking) round a large oak that swarmed with Scarabæ'i solstitiales, or fern chafers. He continues: "The powers of its wing were wonderful, exceeding, if possible, the various evolutions and quick turns of the swallow genus." But the circumstance that pleased him

most was, that he saw it distinctly, more than once, put out its short leg while on the wing, and, by a bend of the head, deliver somewhat into its mouth. "If it take any part of its prey with its foot," says he, "as I have now the greatest reason to suppose it does these chafers, I no longer wonder at the use of its middle toe, which is curiously furnished with a serrated claw." Then the leg, foot, and claw, Mr. White supposes, were designedly constructed to assist the bird in the capture of its insect food. But it is worthy of remark, he only supposes this; he did not observe the act. It is the more important to bear this distinction along with us, as he was a most acute observer, and faithful narrator of facts; and, indeed, never more so than in the present instance. His description of the particular action of the bird is incontrovertibly true; the putting out of the leg is always accompanied by a simultaneous bend of the head, but I could never discover the "delivery of somewhat into its mouth." Besides it occurs to me, if such were the fact, a twofold action of the leg would become necessary; one when it is first struck out to seize the insect, and the other to convey it into the mouth; and in such case, there would be one such motion of the leg unaccompanied by the bend of the head: but we shall always find that, whenever the leg is so put out, the head is at the same instant bent towards it; they move together, and the manœuvre is quickly performed.

Very different from this is the purpose wherein I consider its chief use consists, which is simply to comb or dress out the vibrissæ (*vibro*, to shake or move nimbly; bristles.) For this employment (and, in my opinion, it is no mean one in the economy of this bird) the entire mechanism of the leg, foot, toe, and claw, is adapted with a wonderful precision; but, for the other purpose, there does not appear the least suitability whatever. Even the direction in which the claw is bent peculiarly unfits it for any instrument to seize with; while it expressly is the very thing that fits it for a *comb*: and that the bird needs such an instrument, will scarcely be disputed; for it is easy to imagine how, in various ways, the vibrissæ may get bent, or clotted together at their points, so as to interfere with the regular muscular action at their bases. Moreover, these vibrissæ form no very unessential part of the apparatus which is unquestionably formed for the express purpose of capturing food, the mouth: the bird is seen to exercise it for that purpose, he hawks about with its spacious cavity wide exposed, and can with much more ease extend it in any required direction farther than his leg would reach to. Examine the bird, and you will instantly pronounce the mouth complete for this end; the bird needs no additional help, he cannot have a better, and least of all does his foot supply it.

Lest it might be thought of me that I am presuming too far, because in this matter it is very difficult to decide from observation, as the motions of the bird are so quick, and the light unfa-

vourable by reason of the hour of the evening, and the shade of the trees generally, I think I have seen the bird several times use his foot as I have described; I am almost sure my eyes cannot have deceived me.

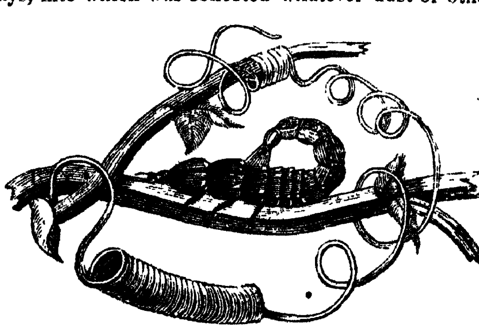
CLEANLINESS OF ANIMALS.

MR. RENNIE, in an interesting paper "On the peculiar habits of cleanliness in some animals,"* has the following illustration in the grub of the glow-worm.

After watching it for some time, (observes Mr. R.) my attention was drawn to some very singular movements which it made with its tail, and which the reader will understand better if he has observed how the common earwig, or the insect popularly called the devil's couch-horse, (*Goërius olens*, STEPHENS,) bends up its tail over its back, somewhat in the manner of a spaniel when it trips along well pleased before its master.

There appeared to be something so uncommon in these movements, that my curiosity was excited to observe them more minutely; and as the creature was not at all timid, I could easily observe it through a glass of some power. The caudal instrument I discovered, by this means, to consist of a double row of white cartilaginous rays, disposed in a circle, one row within the other; and, what was most singular, these were retractile, in a similar manner to the horns of the snail. The rays were united by a soft moist, gelatinous membrane, but so as to be individually extensile; one or two being frequently stretched beyond the line of the others. The rays were also capable of being bent as well as extended, and they could therefore be applied to the angles or depressions of an uneven surface.

It was not long before I convinced myself that this singular instrument was employed by the insect for cleaning itself; and it would have been difficult to devise anything more effectual for the purpose, though its action was different from all others of this kind with which I was acquainted, inasmuch as it operated by suction, and not as a comb, a brush, or a wiper, of which I shall mention some examples in the sequel. It was, moreover, furnished in the interior with a sort of pocket, of a funnel shape, formed by the converging rays, into which was collected whatever dust or other impurities were detached from the body, till it could hold no more, when, by a vermicular movement of the rays, the accumulated pellet was extruded, and placed with great care in some place where it might be out of the way of again soiling the glossy skin of the insect. This skin, if I may call it so, was of a soft,



Larva of the glow-worm on a tendrilled branch, using its cleaning instrument.

* Journ. of the Royal Institution, No. 1.

leathery appearance; exhibiting, when magnified, a minute delicate dotting, similar to shagreen—but to the naked eye this was not apparent.

The instrument just described, accordingly, when expanded over a portion of this shagreened surface, was subsequently drawn out, with an evident effort, (repeated, if necessary,) in the same way as boys draw their moist leather suckers, when they amuse themselves in dragging stones after them. Every particle of dust or other extraneous matter is thus detached from the skin, and, by a peculiar movement of the retractile rays, is lodged in the funnel-shaped pocket.

This singular instrument is also used for the very different purpose of assisting the animal to walk, and particularly to maintain a position against gravity, which its feet are ill calculated to effect.

Though not directly connected with my immediate subject, it may be interesting to many readers to mention that the above grub distinctly proved the fallacy of the common doctrine respecting the light of the glow-worm, which goes to maintain that it is a lamp, lit up by the female, to direct the darkling flight of the male. "Ce sont," exclaims Dumeril, "les flambeaux de l'amour—des phares—des télégraphes nocturnes—qui brillent et signalent au loin le besoin de la production dans le silence et l'obscurité des nuits."* Mr. Leonard Knapp, refining upon this notion, conjectures that the peculiar conformation of the head of the male glow-worm is intended as a converging reflector of the light of the female, "always beneath him on the earth." "As we commonly," he adds, "and with advantage, place our hand over the brow, to obstruct the rays of light falling from above, which enables us to see clearer an object on the ground, so must the projecting hood of this creature converge the visual rays to a point beneath."

Unfortunately for this theory, the grubs—which being in a state of infancy, are therefore incapable of propagating—exhibit a no less brilliant light than the perfect insect. De Geer says the light of the grub was paler, but in the one which I had it was not so. He also remarked the same light in the nymph state, which he describes as "very lively and brilliant;" and, in this stage of existence, it is still less capable of propagating than in that of larva. "Of what use then," he asks, "is the light displayed by the glow-worm? It must serve some purpose yet unknown. The authors who have spoken of the male glow-worms say positively that they shine in the dark as well as the females." These plain facts appear completely to extinguish the poetical theory. But to return to our immediate subject.

A very remarkable instrument, which recent observations seem to prove to be intended for a similar purpose to that of the caudal apparatus of the glow-worm, just described, occurs in the fern-owl, or night-jar (*Caprimulgus Europæus*,) popularly called the goat sucker, from an erroneous notion that it sucks goats—a thing, which the structure of its bill renders impossible as that of cats sucking the breath of infants, as is also popularly believed. The bird alluded to has the middle claw cut into serratures, like a saw or a short-toothed comb; the use of which structure seems to have been misunderstood by White of Selborne.†

"If it takes," says he, "any part of its prey with its foot, as I have the greatest reason to believe it does chafers, (*Zenthcumia solstitialis*,

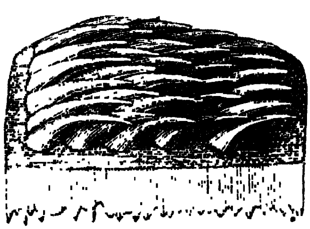
* Dictionnaire des Sciences Naturelles.

† See page 146 of this volume.

LEACH, MS.,) I no longer wonder at the use of its middle toe, which is curiously furnished with a serrated claw."* Mr. Dillon has recently controverted this opinion; his observations leading him to suppose that the serratures are employed by the bird to comb its whiskers (*vibrissæ*)† Mr. Swainson, again, a high authority on such a subject, thinks that the fact of an American group of the same birds (*Caprimulgidæ*), which have no whiskers to comb, and an Australian group, which have whiskers, but no serratures on the claws, are discordant with Mr. Dillon's opinion. It frequently happens, however, that the most ingenious and apparently incontrovertible reasoning in natural history, is overturned or confirmed by facts accidentally observed. I was, I confess, disposed to think Mr. Dillon's opinion more plausible than true, and to agree with White, and the learned arguments of Mr. Swainson, till I met with some observations of the distinguished American ornithologist, Wilson, upon some of the transatlantic species. In his description of the whip-poor-will (*Caprimulgus vociferus*), he says, "the inner edge of the middle claw is pectinated, and from the circumstance of its being frequently found with small portions of down adhering to the teeth, is probably employed as a comb, to rid the plumage of its head of vermin, this being the principal and almost the only part so infested in all birds."‡

It may not fall in the way of many of the readers of this paper to make personal observations on the foot-comb of the night-jar; but similar instruments, of still more ingenious construction, may be inspected, by whoever will take the trouble, in two of our most common animals—the cat and the house-fly (*Musca Domestica*) both of which may very frequently be seen cleaning themselves with the utmost care. The chief instrument employed by the cat is her tongue; but when she wishes to trim the parts of her fur which she cannot reach with this, she moistens, with saliva, the soft spongy cushions of her feet, and therewith brushes her head, ears, and face, occasionally extending one or more of her claws to comb straight any matted hair that the foot-cushion cannot bring smooth, in the same way as she uses her long tusks in the parts within their reach.

The chief and most efficient cleaning instrument of the cat, however, is her tongue, which is constructed somewhat after the manner of a currycomb, or rather of a wool-card, being beset with numerous horny points, bent downwards and backwards, and which serve several important purposes, such as lapping milk, and filing minute portions of meat from bones. But what falls chiefly to be noticed here, is its important use in keeping the fur smooth and clean; and cats are by no means sparing in their labour to effect this. The female cat is still more particular with her kittens than herself, and always employs a considerable



Magnified view of a portion of the upper part of the Cat's Tongue.

* Nat. Hist. of Selborne, i. 160. Ed. Lond. 1825.
† Lou. Mag of Nat. Hist. ii. 31. ‡ Wilson's American Ornithology.

portion of her time in licking their fur smooth. The little things themselves, also begin, when only a few days old, to perform the office for themselves; and I have observed the half-fledged nestlings of the black cap (*Sylvia atricapilla)*, and a few other birds, preening their feathers as dexterously almost as their dam herself could have done.

It requires the employment of a microscope of considerable power to observe the very beautiful structure of the foot of the two-winged flies *(Muscidæ)*, which still more closely resembles the currycomb, than the tongue of the cat does. This structure was first minutely investigated by Sir Everard Home and Mr. Bauer, in order to explain how these insects can walk upon a perpendicular glass, and can even support themselves against gravity. Of the structure of the foot of flies, considered as an instrument for cleaning, I have not hitherto met with any description in books of natural history, though most people may have remarked flies to be ever and anon brushing their feet upon one another, to rub off the dust, and equally assiduous in cleaning their eyes, head, and corslet with their fore-legs, while they brush their wings with their hind legs. In the common blow-fly (*Musca carnaria)*, there are two rounded combs, the inner surface of which is covered with down, to serve the double purpose of a fine brush, and to assist in forming a vacuum when the creature walks on a glass, or on the ceiling of a room. In some species of another family (*Tipulidæ)*, there are three such combs on each foot. It may be remarked, that the insects in question are pretty thickly covered with hair and the serratures of the combs are employed to free these from entanglement and from dust. Even the hairs on the legs themselves are used in a similar way; for it may be remarked, that flies not only brush with the extremities of their feet, where the curious currycombs are situated, but frequently employ a great portion of their legs in the same way particularly for brushing one another.

There is another family of animals no less repulsive to the feelings of many people, though not proverbially dirty as the swine, which I have discovered to be peculiarly cleanly; I refer to the several species of spiders. During the course of a series of observations and experiments on the process by which they can shoot lines of their gossamer silk across a brook, or other intervening obstacle, it was indispensable that I should pry with minute attention to their every movement; and I was soon struck with one which interested me not a little, in the instance of one of the long bodied species, *(Tetragnatha extensa*, LATREILLE*)*. It appeared to be mumbling, if I may use the term, its legs between its mandibles, drawing each leisurely along, as a dog may be seen to gnaw a bone when not very much in earnest, but more by way of pastime than of making a dinner. I could not at first account for this; the ancient naturalists, who drew largely on their imagination when facts failed them, would at once, I have no doubt, have leapt to the conclusion, that the spider, in default of prey, actually devoured its own legs, as it has been asserted to do its web.*

A little attention convinced me, that the movements alluded to were precisely of the same kind as the preening of birds. Spiders have their legs more or less covered with sparse hair, which, being rather long and bristly, is apt to catch up bits of their own web and other extraneous matters, and these, from the delicacy of their semi-transparent skin, must produce uncomfortable irritation. To free themselves from this is

* BLOOMFIELD's *Remains*, vol. ii.

one of their daily occupations; and when a spider appears to the less minute observer to be quite at rest, it will often be seen, on close inspection, to be assiduously and slowly combing its legs in the manner I have above mentioned. The term *combing* is very appropriate in the instance of the common garden-spider *(Epeira diadema)*, which is furnished with a set of teeth somewhat in form of a comb; but it has another instrument in addition to this, peculiarly useful in the process, consisting of a smooth and somewhat curved horny needle, which bends over the teeth of the comb, and holds the limb which it is dressing more firmly down, as if, after entering it in the air, we were to apply a finger over the edge of one of our artificial combs. In some other spiders *(Dysdera erythrina, &c.)* there is, in the situation of the comb just described, a closely set brush of thick hairs, which is employed in the same way. Any person who will take the trouble may readily verify these observations by confining a spider in a wine-glass, placed in a saucer filled with water, from which it cannot escape, so long as there is no current of air to carry off a silken line for a bridge.

Those who have paid attention to ants may have remarked that a pair of them may be often seen touching one another with their antennæ, and even passing their tongues over part of each other's bodies, in the same way as they are seen to do with their eggs, larvæ, and pupæ, erroneously imagined by the ancients to be hoarded grain. The necessity which they are under of moving these to various parts of the colony, in consequence of variations in the weather, must often expose them (polished though they be) to soiling; but the careful nurses instantly remove every thing of this sort with their mandibles, or tongue—movements which have been misinterpreted, as licking the pupæ into shape; as the bear is no less erroneously asserted to do by her cubs. In all such cases, cleanliness seems to be the chief, if not the sole, motive; as those mutual caresses of the working ants are, I think, for the same purpose. These, indeed, remind me strongly of the common practice of horses and cows of cleaning each other's necks and heads, which the individual cannot itself reach with its tongue; and, in the same way caged birds will sometimes do the friendly office to a fellow-prisoner, of pecking off anything extraneous adhering to the head or the bill, where preening is impossible, and the foot is seldom well adapted to the purpose.

THE PORTUGUESE MAN OF WAR.

A RECENTLY published number of the *North American Review* contains a description of a natural object but little known to general readers, though said to be familiar to those who navigate between the tropics, the beautiful and enigmatical insect commonly called the Portuguese Man of War. It is from a Memoir to Dr. Tilesius, who accompanied Mr. de Krusenstern in his voyage round the world. "This singular animal had several times been delineated, described, and endowed with names; yet not only its denominations were various, but also the nature and characteristics ascribed to it. According to some it was a polypus, according to others a zoöphyte, and others ranged it among the Mollusca. Naturalists who followed in the steps of Linnæus have called it the Physalis. Wonderful as are all the works of

Providence, admirably fitted as are the several parts of each created being for their several functions, complex in their composition as they sometimes at first seem, while yet they are always found to be really so simple and suitable in their action on a nearer investigation, we may nevertheless venture to rank this little animated creature among the most curious phenomena. A worm between six and eight inches in length, which is found but in certain latitudes, has seemingly the skill and knowledge of an experienced navigator, and is in itself a little ship. Its evolutions are according to the winds; it raises and lowers its sail, which is a membrane provided with elevating and depressing organs. When filled with air, it is so light, that it swims on the surface of alcohol, and is at the same time provided with a structure, which furnishes it with the necessary ballast. When high winds would endanger its existence, it descends into the deep, and is never seen on the surface of the water. From the under side of the body proceed tubes, which extend twenty feet in length, and are so elastic and delicate, that they wind in a spiral form like a screw, serving at once as anchors, defensive and offensive weapons, pneumatic tubes and feelers. The insect has the colours of the rainbow; its crest, which performs the office of a sail, is intersected with pink and blue veins, trimmed with a rosy border, and swells with the winds, or at the animal's pleasure. The fibres contain a viscous matter, which has the property of stinging like nettles and produces pustules. It acts so strongly that vessels in which they have been kept for a time, must be repeatedly washed before they can be used. These fibres may be cut off without depriving them or the rest of the insect of the principle of life; and the separation takes place spontaneously, whenever the glutinous matter comes in contact with a hard surface like the sides of a glass globe. The insect has, however, dangerous enemies in small dolphins, and medusæ, against which neither its nautical skill nor its poison can defend it.

BURNING COAL MINE AT NEW SAUCHIE.

It is now more than two years since the snow lying on a field on the farm of Shaw Park, belonging to the Earl of Mansfield, was observed to melt almost as soon as it fell, and then rise in a state of vapour. The phenomenon attracted the attention of the managers of the Alloa and Devon collieries, and was found to be the effect of the heat produced by a stratum of coal in a state of ignition, technically known by the name of the nine feet seam, from which the Devon iron works are supplied with a large proportion of their fuel. Various plans were at the same time suggested to extinguish the flames, and after several failures, it was determined to cut a mine round the seam to prevent their extension. Workmen were set to excavate this mine, which was opened at both sides of the seam, to build a wall as they proceed-

ed, on the sides of the two tunnels next the fire. In this way it was intended to proceed, till the tunnels penetrated beyond the fire, when they were to be joined in the form of a horse shoe, and thus cut off, by means of a strong wall, all connexion between the ignited part of the seam and the remainder of it. This plan has been persevered in for a year and a half, but has never been completed. The workmen have often brought two walls within a few fathoms of meeting, but owing to the fire bursting in upon them, they have been hitherto obliged to fall back again and take a wider circle. Six or seven shafts have been sunk to ventilate the tunnels, in which the heat is frequently so great as to raise the thermometer from 212 to 230 degrees Fahrenheit;—it sometimes rises even higher. The lamps of the miners which are hung upon the walls, have more than once fallen to pieces from extreme heat.*

DESTRUCTION OF LIVE STOCK BY WOLVES IN RUSSIA.

In the government of Livonia alone, the following animals were destroyed by wolves in 1823. The account is an official one.

Horses, - -	1,841	Goats - -	2,545
Fowls, - -	1,243	Kids, - -	183
Horned Cattle, -	1,807	Swine, - -	4,190
Calves, - -	733	Sucking Pigs, -	312
Sheep, - -	15,182	Dogs, - -	703
Lambs, - -	726	Geese, - -	673

SUPPOSED SERIES OF SUB-MARINE BANKS FROM NEWFOUNDLAND TO THE ENGLISH CHANNEL.

From the Great Bank of Newfoundland to the English channel, it was found that whenever we approached towards the *Vigias* or dangers laid down in the charts, the water changed from the deep blue of the ocean to green; in some instances to a light pea-green; and this colour was not the effect of any change in the state of the atmosphere, but remained the same under the different alterations of sunshine, cloudy weather and haze. These changes were so remarkable, that they became the subject of conversation on board, and occupied my attention particularly. On an inspection of the chart, I came to the conclusion that, as this part of the north Atlantic, lying between the Newfoundland and the English Channel, crosses the meridian of the volcanic islands of Iceland and the Azores, there are connecting ramifications between the subterranean fires of Iceland and those of St. Michael of the Azores, and that the spaces of green water† over

* Stirling Journal.

† It may be worthy of notice, as a circumstance strengthening my opinion, that the Medusæ, Polypi, &c. were infinitely more abundant in these spaces of green water, than in those of a blue colour; indeed, very

which we sailed in this route, were indications of the superior elevation of the bottom of the ocean in the lines of communication between the two volcanic lands above-named; and the coincidence of the water changing colour as we approached the different rocks, shoals, and islets, placed in the chart in this part of the Atlantic, (some of which have been verified) supported the probability of the conclusion I had drawn. Assuming, therefore, that these banks, (which I conceive to be detached, that is to say, having deep water between them from N. to S.) exist, and are the lines or conductors of volcanic matter from Ireland to the Azores; we may readily account for the appearance and disappearance of such islands, rocks, &c. as Buss Island, the rocks seen by Sir Charles Knowles, those looked for by Admiral Rodney, westward of Ireland, Jaquett Island, the Devil's Rock, and the Eight Stones north of the Madeiras, &c. &c. because we have undoubted proofs that sub-marine volcanoes throw up islands and rocks from a very great depth, as in the instance of *Sabrina* island off St. Michæl's; and that islands disappear from the same cause, as instanced in the submersion of *Gouberman's* islands on the coast of Iceland, and *Rober's* isle at the cape of Good Hope. I consider, therefore, that from the longitude of 10 deg. W. to the Banks of Newfoundland, and from the Madeiras to Iceland, that is from 32 deg. N. to 65 deg. N. the ocean comprised within that area, is the seat of the different branches of sub-marine volcanic matter in the north; and this may account for the frequent shocks of earthquakes felt in Great Britain and Portugal. As far as my own ideas go concerning volcanoes, I am willing to believe, that throughout the whole earth they are connected by subterranean and sub-marine tubes or channels, and this hypothesis is borne out by the facts so plain, as to be almost demonstrative with regard to earthquakes, which philosophers consider as occasioned by subterranean fire and water creating and exploding gaseous fluid. Upon this view of the subject, we might carry our line from the Madeiras to the Canaries, proceeding on to the Cape Verds, St. Helena,* &c. &c. and it has often struck me, with respect to the Atlantide Island of the Ancients, if such ever existed, that it occupied that space of the ocean lying between Porto Santo and the Azores, and that these islands formed the extremes, the centre part having sunk into the bosom of the deep by the agency of volcanic fire. I may close these remarks by observing, that the captain (an officer of the navy, possessing experience and scientific knowledge) of the vessel in which I was appeared at first sceptical with respect to my hypothesis, but

few of the larger species of these animals were seen in the latter, they were generally of the small orbicular kind; whereas in the green water they were frequently from three to five feet in diameter, of an infinite variety of shapes and of the most brilliant colours.

* All those islands are of volcanic origin.

*at last, from his own attentive observations, became fully convinced of its probability.**

MECHANISM OF THE HUMAN VOICE IN SINGING.

A MEMOIR on this curious subject has been read to the Academy of Sciences by M. Bennati, and examined by MM. Cuvier, Prony, and Savart. The former of these three philosophers has reported thereon to the Academy. The principal object of the memoir is to make known the powers of an organ in effecting the modulations of the voice, which in this point of view has been little attended to by physiologists. This is the soft palate, or the narrow part of the gullet formed above by the uvula, at the sides by the arches, and at the bottom by the root of the tongue. M. Bennati has succeeded in constructing an instrument which can include three octaves. He points out in his memoir the precautions which should be taken in this respect for the instruction of young persons destined to be vocalists; amongst one of the principles, is, to interrupt the exercises at the period when the voice changes. M. Bennati concludes his memoir by this proposition, that it is not only the muscles of the larynx which serve to modulate the sounds, but also those of the os hyoides, of the tongue, and of the veil of the palate; without which all the degrees of modulation necessary in singing cannot be attained. From hence it results that the organ of voice is an organ *sui generis*, an instrument inimitable by art, because the materials of its mechanism are not at our disposal, and we cannot conceive how they are appropriated to the kind of sonorousness which they produce. This result, although not entirely new to science, appears to the reporters to be proved by M. Bennati by new facts and observations, and to have acquired such developement as to fix the attention of physiologists.†

VISION OF BIRDS OF PREY.

By Dr. J. Johnson.

IT always appeared to us most extraordinary, indeed unaccountable, that birds of prey could scent carcasses at such immense distances as they are said to do. We were led to scepticism on this subject some twenty years ago, while observing the concourse of birds of prey from every point of the horizon to a corpse floating down the river Ganges, and that during the north-east monsoon, when the wind blew steadily from one point of the compass for months in succession. It was extremely difficult to imagine that the effluvia from a putrefying body in the water could emanate in direct opposition to the current of air, and impinge on the olfactories of birds many miles distant.

* United Service Journal. † Revue Ency. xlvi.

Such, however, were the *dicta* of natural history, and we could only submit to the general opinion. We have no doubt, now that we know the general opinion to be something wrong, that it was by means of the optic rather than the olfactory nerves "that the said birds smelled out their suit."

The toucan is a bird which ranks next to the vulture in discerning, whether by smell or by sight, the carrion on which it feeds. The immense size of its bill, which is many times larger than its head, was supposed to present in its honeycomb texture an extensive prolongation of the olfactory nerve, and thus to account for its power of smelling at great distances; but on accurate examination, the texture above mentioned in the bill is found to be mere diploe, to give the bill strength. Now the eye of this bird is somewhat larger than the whole brain; and it has been ascertained, by direct experiments, that where very putrid carrion was inclosed in a basket, from which effluvia could freely emanate, but which concealed the offal from sight, it attracted no attention from vultures and other birds of prey till it was exposed to their view, when they immediately recognised their object, and others came rapidly from different quarters of the horizon where they were invisible a few minutes before. This sudden appearance of birds of prey from immense distances and in every direction, however the wind may blow, is accounted for by their soaring to an altitude. In this situation their prey on the ground is seen by them, however minute it may be; and therefore their appearance in our sight is merely their descent from high regions of the atmosphere to within the scope of our optics. The toucan in India generally arrives a little in the arrear of the vulture, and remains till the larger bird is glutted; while smaller birds of prey, at a still more retired distance, pay similar homage to the toucan.*

NEW SPECIES OF BRITISH SNAKE.

Mr. T. M. Simmons has discovered, near Dumfries, in Scotland, a species of snake which seems to be new to our naturalists, and which has been appropriately called Coluber natrix: it has no ridged line on the middle of its dorsal scales, which are extremely simple and smooth The number of scales under the tail is about eighty, and the plates on the belly one hundred and sixty-two. The only specimen hitherto found measured five inches, was of a pale colour, with pairs of reddish-brown stripes from side to side over the back, somewhat zig-zag, with intervening spots on the sides. It comes nearest in character to a species of snake (Coluber austriacus, *Linn.*) which is common in France and Germany, and which has smooth dorsal scales, like the Dumfries snake. The latter, also, if the figure published by

* Medico-Chirurgical Review. Nat. Mag., ii. 473.

Sowerby be correct, has large scales on the head, which proves that it cannot be the young of the common viper, which, however, had also ridged scales.*

ON THE EXISTENCE OF ANIMALCULÆ IN SNOW.

The following account was sent by Dr. J. E. Mure in a letter to Dr. Silliman. When the winter had made a considerable progress without much frost, there happened a heavy fall of snow. Apprehending that I might not have an opportunity of filling my house with ice, I threw in snow, perhaps enough to half fill it. There was afterwards severely cold weather, and I filled the remainder with ice. About August the waste and consumption of the ice brought us down to the snow, when it was discovered that a glass of water, which was cooled with it, contained hundreds of animalcules. I then examined another glass of water, out of the same pitcher, and with the aid of a microscope, before the snow was put into it, found it perfectly clear and pure: the snow was then thrown into it, and on solution the water again exhibited the same phenomenon—hundreds of animalcules, visible to the naked eye with acute attention, and, when viewed through the microscope, resembling most diminutive shrimps, and, wholly unlike the eels discovered in the acetous acid, were seen in the full enjoyment of animated nature.

"I caused holes to be dug in several parts of the mass of snow in the ice-house, and to the centre of it, and in the most unequivocal and repeated experiments had similar results; so that my family did not again venture to introduce the snow-ice into the water they drank, which had been a favourite method, but used it as an external refrigerent for the pitcher.

"These little animals may class with the *amphibia* which have cold blood, and are generally capable, in a low temperature, of a torpid state of existence. Hence their icy immersion did no violence to their constitution, and the possibility of their revival by heat is well sustained by analogy; but their *generation*, their *parentage*, and their *extraordinary transmigration*, are to me subjects of astonishment.†

INFLUENCE OF THE AGE OF PARENTS ON THE SEX OF CHILDREN.

The following results are extracted from a letter written by Professor Hosacker to the Editor of the *Medical Gazette* of Inspruck:—

i. In those marriages where the mother is older than the father the number of boys is to that of girls as 90.6 to 100. ii. The parents being of the same age, the boys were to girls as 90 to 100. iii. The father being from three to six years older than the mother, the proportion of boys to girls was as 103.4 to 100. iv.

* Mag. Nat. Hist. † Silliman's Journal.

The father being from six to nine years older than the mother, the boys were to the girls as 124.7 to 100. v. The father being from nine to twelve years older than the mother, the male children were to the female as 123.7 to 100. vi. The father being eighteen years or more older than the mother, the boys were to the girls as 200 to 100.*

PROTRACTION OF VEGETABLE LIFE IN A DRY STATE.

MR. HOULTON produced a bulbous root which was discovered in the hand of an Egyptian mummy, in which it probably had remained for two thousand years. It germinated on exposure to the atmosphere; when placed in earth it grew with great rapidity.†

ON THE HABITS OF THE CHAMELEON.

By Henry Slight, Esq. M.R.C.S., Honorary Librarian to the Portsmouth Philosophical Institution.

THE animal spoken of, was sent with a smaller one from Malaga, as a present to me, by Colonel Craig: they arrived by the Duke of York steam-packet, on the return of the staff of the troops from Portugal, and were kept in my drawing-room for months. The larger one was of a lightish sap-green colour; the smaller one, much darker. They were kept on a wicker basket in the bow-window, not confined; and slept many hours in the day, lying on a projecting ridge of the wicker work. During the sunshine, the animals rendered themselves flat, with a view to expose themselves as much as possible to the influence of the warmth; and they were at these times often of a greenish stone colour, and pale. If, however, disturbed, they contracted the abdomen, expanding the ribs, and often became instantaneously of a dark green or even indigo green colour. *Sometimes only one side changed colour.* The larger one was apparently vigorous, and in health: when awake, its eye (of a dark colour, and very lustrous) was constantly directed in every possible direction, the motions being by a kind of jerk, and very rapid, as if in search of food; of which, however, it partook sparingly. I was accustomed to put the common cockroach, in number about six or seven, in a shallow tin vessel, and to place the chameleon on the edge, its head projecting over the brim, to which its forceps were generally so firmly attached that it was often difficult to remove them. After making a circuit round some portion of the circle, the animal would distend the pouch beneath the jaws, expanding them two or three times in a trifling degree; and, stretching forward its body on the fore legs, it would suddenly dart out its tongue, with such force as to make a very sensible ring or noise on the opposite side of the tin; would catch the beetle or roach on the trumpet-shaped extremity of the tongue,

* Bib. Univ. † Med. Journ.

which was retracted as quick as lightning, and mastication and deglutition followed. In this manner it would take three or four of the insects from the vessel; but I could never induce it to take them from my hand, nor would it eat them when the mouth was opened, and the roach introduced with the fingers: a mode I was obliged to have recourse to with a view to feed the smaller one, which appeared languid, and died about two months after its arrival. It would, however, swallow the large flesh fly, if introduced into its mouth, although there was some difficulty in opening the jaws contrary to the will of the animal. They slept generally on the top of the basket, the heads projecting over the edge, and the tails curled round one of the small divisions of wicker-work; and it was curious to observe the firm attachment they had by this means. On going into the room with a candle, the creatures always appeared of a pale ashy stone colour, or a spectral blue, precisely similar in hue to the colour produced on the hand when held before a blue glass, as seen in the windows of chemists. Their motions were exceedingly slow, and they always firmly attached one leg to whatever substance they could reach, before they let go with the other. The creatures did not feed more than once in three or four days; and they would never catch any of the beetles with a hard covering, many species of which I collected in my walks, and exposed to them in the tin vessel. Several times I lost them, and was afraid to step about the room, lest, from their variety of colour, I should tread on them; but I generally found them in the folds of the curtains, always on the blue lining, and not on the chintz pattern. During the long time I kept them, they had alvine secretions, of a pale yellow colour, and in rounded conjoined lumps, not more than four times. I have often seen one side of the creatures, more especially the larger one, nearly stone colour, and the other a black green; and the changes of hue were always very rapid, and accompanied with either elevation or depression of the ribs. The skin of the creatures I should resemble to an infinite number of facets of a certain determinate figure; and I think the changes of colour depended on the power of the animals to elevate, alter, and depress the faces or angles of these facets (I am not much of a philosopher, and I scarcely know if I have rendered myself intelligible in this last sentence), and the consequent difference of angle at which the light was received.

The animals died from the effect of cold, and are now in the museum of the institution here.*

PECULIAR FORMATION OF THE NEGRO STOMACH.

"I HAD frequently observed," says Mr. Madden, "that the exhibition of an emetic to the negro soldiers was often attended with convulsions, and even death: on further inquiry I found

* Mag. Nat. Hist.

that these remedies invariably produced distressing effects on all the black people of *Dougola* and *Sennaar*. On examining the body, I found the stomach different from that organ in white people, both in size and structure. As this difference has not been noticed hitherto, I am free to acknowledge, that the appearance I observed, might be the consequence of disease, and not its natural state; but as I remarked the same especial difference in three cases, I think I am warranted in the supposition that the smallness of the negroes' stomachs, and the peculiar corrugation of their folds, are no less distinct marks of that race, (insomuch as physical organization is concerned,) than their thick craniums and prominent cheek bones. The vulgar notion of "thick headed" persons being obstinate, is founded in truth. But the peculiarity to which I alluded was this, the stomach was below the ordinary size of that organ in Europeans, and its internal surface resembled in some degree a turtle's throat, from the extent of its corrugations. I discovered likewise, a difference in the skeleton, in two of these cases, each having six vertebræ of the loins, instead of five, and on examining the spines of many living negroes, I find the occurrence of six lumbar vertebræ very frequent. This accounts for the extraordinary length of the lumbar part of the back in so many negroes. That they are a distinct race I think is evident from these, and other peculiarities.*

SPONTANEOUS COMBUSTION OF BOTH HANDS.

The following case of spontaneous human combustion, from the Archives Gén. de Médicine, for March 1829, is given as superior in point of authenticity, to any former one on record. A gentleman of a robust healthy constitution, and temperate habits, 24 years of age, extinguished with his hands the burning clothes of his brother, who had accidentally set fire to them with sulphur, and was immediately afterwards attacked with such acute pain in both hands, as to compel him to cry out for assistance. A woman who came to his succour, observed that both hands were surrounded by a blue flame. This at first was supposed to be occasioned by the sulphur adhering to them, and an attempt was made to extinguish the flame with cold water, but without effect. The gentleman then ran down stairs to a cutler's shop, and plunged his hands into a quantity of mud; from this he derived very little relief. After suffering in this manner much torture for half an hour, he ran to the house of Dr. Richard de Brus, by whom the case is related. On the way, both he himself, and the woman who accompanied him, observed distinctly the blue flame surrounding the hands. The physician met him at the door, and observed the hands to be red, swelled, and exhaling a kind of smoke or vapour. He immediately directed his patient to plunge

* Travels in Egypt.

his hands into a well which was opposite, and to keep them there, until he experienced relief; on his doing so, the pain abated considerably, and the flame ceased, but he had not gone more than 150 paces homewards, when it reappeared. On reaching his dwelling, he immersed each of his hands in a bucket of water, which as it got *rapidly heated*, he had repeatedly renewed. As often as he took them out of the water, he remarked a sort of unctuous matter flow along his fingers, and the blue flame reappeared, the latter was not however visible, except in a situation where the light of the candle was shaded, as under the table. A young gentleman who remained in the room with him, saw the blue flames several times in the course of the night; towards day-break only *sparks* were visible. During the succeeding day the pain was very severe, and large vesications filled with a reddish serum had formed on the fingers in some places, indeed the cuticle was entirely removed, and the cutis greyish and corroded. The vesications being opened, cerate was applied to the denuded surfaces, and the whole covered with poultices. The inflammation which followed was moderate, the suppuration healthy, and in six weeks the ulcers caused by the burning were entirely healed, but the cicatrices were very distinct, and several of the nails had dropped off.*

ON THE DEVELOPEMENT AND GROWTH OF CANTHARIDES.

THE flies always deposited their eggs on the smooth sides of the vessel in which they were inclosed; but it was found requisite that these sides should not be transparent; so that when glass capsules were used they were covered with black paper, and there the eggs were deposited. Each female produced from 100 to 200 in a small heap. Nothing is more difficult than to observe the transformation of these eggs into larvæ, in consequence of the momentary nature of the change. M. Zier knowing about what time to expect the change with certain eggs, waited for and watched them under the microscope, and was fortunate in catching the moment. He first remarked certain slight motions followed by others much stronger and quicker, at one end of the egg, and instantly it was converted into a living being, a small larva. It was impossible to discover any envelope which might be supposed to be left by the insect; the whole egg appeared to be vivified.

The larva is at first colourless and formed of 13 rings, of which the first is the head, the three next have each a pair of feet, by which the insect moves with considerable rapidity, the nine other rings form the body. Two black points on the first rings are the eyes, above is a sort of black antennæ, the last ring has two hairs. Almost immediately after the change, the posterior part

* Med. Journ.

of the larva acquires a dark tint, which advances gradually to the fifth ring, the fourth and third remain pale, but the second and first become black.

These small animals move very quickly, and soon leave the place where they were deposited as eggs. When they feel any movement in the neighbourhood, they roll themselves up so as to look like black points. The metamorphosis of all the eggs into larvæ, and the disappearance of the insects, does not require more than a quarter of an hour. The young larvæ reach the earth and then penetrate downwards.*

MATURATION OF FRUIT.

At a late meeting of the Academy of Sciences, M. Couverchel read a paper on this subject. After giving an analysis of the investigations that had already been made, he remarked in what particulars they agree with his own, and then exposed the theory to which his numerous experiments have led him. According to the author, two periods are to be distinguished in the history of the fruit. The first comprehends its developement and the formation of the principles which enter into its composition. In this first period the influence of the plant upon the fruit is indispensable. The second comprehends the ripening properly so called, and is effected by the reaction of the constituent principles of the fruit. In this second period, the acids, favoured by heat, transform the gelatine into saccharine matter. The phenomena are in this case purely chemical: they are independent of vegetable life, and, in fact, most kinds of fruit will ripen after being detached from the tree. The author finds this theory so much the more probable that it agrees with another series of experiments in which he has been engaged, respecting the transformation of fecula into sugar. He remarked the resemblance which these two operations present; and, submitting to the examination of the Academy two new products which he has obtained in treating fecula with vegetable acids, and only varying the proportion, he gave to the first, which is allied to vegetable jelly, the name of *normal gum*, on account of its simplicity, and the property which it has of furnishing only oxalic acid when treated by nitric acid. The other, which possesses all the properties of grape sugar, may easily be confounded with that substance. The author, to prove the resemblance which he pointed out as existing between the two operations, maturation and the conversion of fecula into sugar, remarked that the gelatine, in both cases, always precedes the saccharine matter, and that it is the first of these substances that produces ripening. M. Couverchel's experiments on the juices of fruits, and in particular on the juice of the grape, appear very remarkable; and show the possibility

* Bull. Univ.

of improving wines of inferior quality otherwise than by the addition of substances foreign to their composition, and deleterious in respect to the health. He then described some of the methods which he had sought for the preservation of fruit, and pointed out the circumstances to be avoided in order to attain this important object.*

ESSENTIAL CHARACTERS OF THE ROOTS AND STEMS OF PLANTS.

In whatever medium they are developed, *roots* are always deprived of vital knots symmetrically disposed at their surface, and consequently of foliaceous appendages. The multiplication of their branches is purely accidental. *Stems*, on the contrary, are always provided with vital knots on their surface, symmetrically arranged, or accompanied by a foliaceous appendage,—an organ sometimes reduced to a rudimentary state, or altogether wanting. Potatoes, the bulbs of the *Solanum tuberosum*, are not roots, as generally supposed, but stems expanded at their extremities, and with the interior converted into feculent cells mixed with fibres. And the same phenomena is observed in the bulbs of the Jerusalem artichoke, (*Helianthus tuberosus.*) But the Batatas, (*Convolvulus Batatas,*) is a true tuberculous root.†

BRITISH PEARL FISHERY ON THE CONWAY.

By a Correspondent of the Magazine of Natural History.

It may not be generally known that a pearl fishery exists at the present time in any part of Great Britain. The pearl muscle (Mya margaritifera) is found in abundance in the River Conway, in North Wales, and is collected by many of the natives, who obtain their livelihood entirely by their industry in procuring the pearls. When the tide is out, they go in several boats to the bar at the mouth of the river, with their sacks, and gather as many shells as they can before the return of the tide. The muscles are then put in a large kettle over a fire to be opened; and the fish taken out singly from the shells with the fingers, and put into a tub, into which one of the fishers goes bare-footed, and stamps upon them, until they are reduced into a sort of pulp. They next pour in water to separate the fishy substance, which they call *solach*, from the more heavy parts consisting of sand, small pebbles, and the pearls, which settle in the bottom. After numerous washings, until the fishy part is entirely removed, the sediment is put out to dry, and each pearl separated on a large wooden platter, one at a time, with a feather: and when a sufficient quantity is obtained, they are taken to the overseer, who pays the fisher so much per ounce for them. The price varies from 1*s*. 6*d*. to 4*s*.; there are a number of persons who

* Edin. Journ. † Turpin in Mem. du Mus. d' Hist. Nat.

live by this alone; and where there is a small family to gather the shells and pick out the fish, it is preferable to any other daily labour. The pearls are generally a dirty white, sometimes blue, but never, it is believed, green or reddish. I cannot with accuracy say how many ounces are taken to the overseer each week, though I might say that there are some scores. But what makes this fishery the more singular is the mystery which hangs over it. At present it is a perfect monopoly, and there is but the one who buys them up that knows what becomes of them afterwards. It has been carried on in this manner for many years; and as such a thing, if made public, might prove more beneficial to the neighbouring poor, by causing a higher price to be given for the pearls, through competition, it would be very desirable if any of your numerous correspondents could throw some light on this interesting subject. The huts which have been erected for the convenience of boiling the fish, are on the extremity of the marsh, about a mile north of the town of Conway. The pearls are seldom found here much larger than the enclosed specimens, though about twelve miles up the river, they have been found occasionally as large as a moderate-sized pea, and have been sold for a guinea the couple, but they are very rarely met with. When I say that the price varies from 1*s*. 6*d*. to 4*s*., I do not mean to say that they are valued according to their size, for the large and small pearls are all sold together; but some years ago they were as high as 4*s*., now they are only 2*s*. per ounce.

A WHITE BLACKBIRD.

In a blackbird's nest at St. Austell, Cornwall, in which were two young birds, one of them was perfectly white; and the nest was robbed by a boy, who in a scuffle with the owner of the garden, killed the bird. It was, however, preserved, and is now in the collection of Mr. Jackson of Looe.*

VOICE OF FISHES.

I have often heard it remarked that fish have no voices. Some tench, which I caught in ponds, made a roaking like a frog for a full half hour whilst in the basket at my shoulder.†

REMARKABLE FLIGHT OF SPIDERS.

On the 19th of July a number of aeronautic spiders (at any rate small black spiders capable of flight) by some means found their way into St. John's Church, Hull, and the tops of ladies' bonnets were generally the places whence they commenced their flight, and in it they seemed not to be confined to any particular

* Corr. Mag. Nat. Hist. † Ibid.

direction: some flew upwards at a slight angle, some north, some south, some east, some west; and in so doing several passed so near to each other, that it cannot be conceived, as they passed in opposite directions, that any current of air conveyed them, as two opposite currents could scarce exist so often close to each other. Those which passed near enough to distinguish their forms, all flew with their backs downwards.*

THE CUCKOO.

THE best place for observing the habits of this bird, in England, is on the range of the Malvern Hills, where they abound, in the season, in extraordinary numbers, making the whole circuit of them resound continually with their note, in a most striking manner; and flying about, from tree to tree, in a way which would much delight a person fond of natural history. The workmen of the neighbourhood say a bird comes with them, which they call the cuckoo's maid.†

MERMAIDS.

By a Correspondent of the Magazine of Natural History.

A FEW years back a mermaid was shown in London. This specimen was said to come from Japan. I can aver that it came from the East Indies; for, being at St. Helena in 1813, I saw it on board the ship which was bringing it to England. The impression on my mind was, that it was an artificial compound of the upper part of a small ape with the lower half of a fish; and being allowed to examine it as closely as I pleased externally, my attention was directed, by the aid of a powerful glass, to ascertain the point of union between the two parts. I confess I was somewhat staggered to find that this was so neatly effected, that the precise line of junction was not satisfactorily apparent. I speak of it in its best state of preservation; perhaps now the imposture can be more easily detected. A short time back the skeleton of a mermaid, as it was called, was brought to Portsmouth, which had been shot in the vicinity of the island of Mombass. This was allowed to be submitted to the members of the Philosophical Society, when it proved to be the Dugong. The anatomy and natural history was illustrated by some of the members present, and briefly noticed in the *Annual Report* for 1826-7, p. 21. To those who came to the examination with preconceived notions of the fabulous mermaid, it certainly presented, as it lay on the lecture-table, a singular appearance. It was, if I recollect right, about 6 ft. long: the lower dorsal vertebræ, with the broad caudal extremity, suggested the idea of a powerful fish-like termination; whilst the fore legs, from the scapula to

* Corr. Mag. Nat. Hist. † Ibid.

the extremities of the phalanges, presented to the unskilful eye an exact resemblance to the bones of a small female arm. The cranium, however, had such an *outre* brutal form, that even the most sportive imagination could never have supposed it to have borne the lineaments of the "human face divine." It is now, I believe, in London.

THE GUINEA PIG

Is a native of Guinea and the Brazils, where it is generally of a pure white colour, and seldom variegated with orange and black, in irregular blotches, as in England. They dwell in warrens, like rabbits, whom, in their food and manner of living, they strongly resemble; and would, without doubt, be speedily extirpated by the smaller kinds of cats, in which their country so greatly abounds, were it not for the rapid and almost incredible multiplication of their species, six hundred, on an average, being annually produced from each female. In confinement, their food consists of the most juicy and succulent herbs; they will also eat bread sopped in milk, grains and fruits of all sorts, especially apples: and here it may be well to correct an error of Buffon's, who states, "that, though perpetually throwing out urine, *they never drink*." This, however, is not the case; for all those that I have seen have always manifested a strong inclination for drinking, being particularly fond of milk, and never refusing water when offered them. Their sleep is short and frequent; they utter a shrill piercing cry when in want of any thing, or when any one approaches near them, and frequently perish from cold, moisture, or want of exercise. On the whole, they are extremely timid, delicate, and feeble, but inoffensive, docile, and elegant: useless for food, in this country, at least, or for any of the purposes to which domesticated animals are generally applied, but very well adapted, from their gentleness and beauty, to be kept as pets.*

THE CAUSE OF GOITRE.

In a Letter to the Editor of the Magazine of Natural History.

Sir, Your correspondent Obscurus wishes to be informed what is the most generally received opinion as to the cause of goître, and I should have much pleasure in satisfying him on that point if I were able; but I am sorry to say that no opinion has hitherto been advanced which is at all satisfactory; and as so many eminent individuals have failed in the attempt, I shall not presume to hazard a conjecture on the subject. That it is not produced by drinking dissolved ice or snow, as some have imagined, is evident from the fact that the disease is not uncommon at Sumatra, where neither ice nor snow is ever seen, while in Greenland,

* Mag. Nat. Hist.

where snow-water is commonly used, it is unknown. That it does not depend *exclusively* on a residence in mountainous districts is equally certain, since it is found among all classes of society, in almost all countries, and most frequently among females. Humboldt saw it in South America, in high districts and low ones, in those which were dry as well as in those saturated with damp, in a high temperature as well as in a low one, and worst where the water was chemically the purest. Obscurus is wrong in supposing that the muscles of the neck have any thing to do with true goître, except secondarily, by the extension of the disease to the surrounding parts. It is properly a disease affecting the thyroid gland. As it is generally of little consequence except from the deformity it occasions, those affected with it (in this country at least) are very unfrequently the subjects of a severe operation for its removal; and, if by "the knife" Obscurus means the extirpation of the gland, I believe no one would be so mad as to attempt it, unless the patient's life were in immediate danger from the pressure of the diseased structure on the trachea obstructing respiration. The arteries supplying the tumour (which are generally enlarged) have been tied with partial success, and setons, blisters, leeches, friction with or without medicaments, and pressure, with alkaline and tonic medicines internally, have each and all been more or less successful in different instances; but the greatest dependence at present is upon the preparations of iodine, which are used, not "to neutralize any noxious qualities of the water" drank by the patient, but on account of its peculiar action on the glandular system of the body generally. To its good effects in the early stage of the disease, I can bear witness, but I do not think it would be found equally beneficial in a case of long standing. I am, Sir, &c.

J. Aaron, M.R.C.S.—Birmingham, Sept. 17, 1829.

MARINE VEGETABLES AS ARTICLES OF FOOD.

Mr. Charles Greaves having called upon botanists to direct their attention to marine vegetables as articles of food, it may be advantageous to point out the amount of our present knowledge upon this subject. The kinds as yet generally known to be resorted to as articles of diet are but few, viz. *U*'lva umbilicàta, *F*ùcus esculéntus, edùlis, and saccharinus, and a species found on the coast of some of the islands in the Indian Ocean. Besides these, a second species of *U*'lva, resembling a small brown lettuce, and *F*ùcus vesiculòsus are converted into an inferior kind of food by the poor people on the southern coast of Ireland, while those on the western extract a superior and more nutritive kind of sustenance from the fronds of the *F*ùcus crispus. The wretched people, who are necessitated to have recourse to such coarse and nauseous food as the pounded substance of the *F*ùcus vesiculòsus and saccharinus, are neither to be envied nor imitated;

but the jelly obtained by boiling the Javanese plant, and the *Fúcus críspus*, when properly saved and prepared, are not to be despised, nor the mess procured by stewing and chopping the *Ulva umbilicàta*, and known by the name of stoke or laver.*

FALLS OF NIAGARA.

MR. BAKEWELL, Jun. has contributed to the *Magazine of Natural History*, No. xii., an interesting and important paper descriptive of the Falls of Niagara, and "the physical structure of the adjacent country," accompanied with map-like engravings, sketched by Mr. B. during a recent visit of six days. His inferences are as follow:

A cursory glance at what is now taking place at the Falls, leaves not a doubt that the great cause of the comparatively quick retrograde movement of the Falls is, the loose and soft material on which the limestone rock rests, and the destructive action of the water upon it. The water, also, penetrating the crevices between the strata of solid limestone, detaches them from each other, and disposes them to fall. At present, the limestone rock projects considerably over the shale at the Falls, and it is this projection which makes it practicable to pass between the water and the rock, nearly half way under the Horse-shoe Fall.

A few months before I was at Niagara, a very extensive portion of rock, as before mentioned, fell down at the Horse-shoe Fall. The shock was felt at a considerable distance: the noise was like a distant clap of thunder.

The disintegration of the rocks must continue until the Falls reach Lake Erie, provided the present causes continue to operate. Goats' Island, which now separates the Falls, will, perhaps, as the waters recede on each side of it, remain in the midst of the fallen flood, a high, perpendicular, inaccessible rock: a lasting monument of the destructive power of that element which now thunders at its base.

It may, perhaps, be said that this deep chasm or channel, through which the river runs on its descent, was a rent made by an earthquake. This supposition would avail if the strata were deranged, but the reverse is the fact. The strata on each side are parallel on the same level, and bear evident marks of the action of some powerful instrument having cut through them in a perpendicular direction: that instrument was water. The wall-like appearance of the rocks on each side of the river is precisely the same at the Falls, as at the commencement of the chasm at Queenstown.

By the lockages on the Erie and Oswego canals, lately constructed, it appears that the elevation of Lake Erie above Lake Ontario is 290 feet; and that the elevation of the former lake above the river Hudson, at Albany, is 575 feet. The river at Albany is 150 miles distant from the sea.

Since it is a well established fact that the Falls have receded considerably within the memory of man, and are, by slow but progressive steps, cutting their way backwards to Lake Erie, the mind is led to anticipate the period when the present chasm will extend to that lake, and the consequences which must result from such an event.

* Mag. Nat. Hist.

My father, in a former edition of his *Introduction to Geology*, published in 1815, offered some observations upon this subject, the justice of which seems confirmed, in a remarkable manner, by the recent interesting researches of Mr. Lyell, on the fresh-water formations in the lakes of Scotland :—"Since the banks of the Cataract of Niagara were inhabited by Europeans, the distance has been progressively shortening between the Falls and Lake Erie. When it has worn down the intervening calcareous rocks, and effected a junction, the upper lake will become dry land, and form an extensive plain, surrounded by rising ground, and watered by a river or smaller lake, which will occupy the lowest part. In this plain, future geologists may trace successive strata of fresh-water formation, covering the subjacent crystalline limestone. The gradual deposition of minute earthy particles, or the more rapid subsidence of mud from sudden inundations, will form different distinct beds in which will, be found remains of fresh-water fish, of vegetables, and of quadrupeds. Large animals are frequently borne along by the rapidity of the current, and precipitated down the cataracts: their broken bones, mixed with the calcareous sediment, may form rocks of calcareous tufa, where the waters first subside after their descent."

It may be proper to remark, that the partial drainage of Lake Erie will also effect a corresponding drainage of the other lakes connected with it, and add many thousand square miles of productive soil to the continent of North America.

FLORA OF SICILY.

Of all the European islands, Sicily produces the most favoured and lovely Flora. It possesses plants which are common to Italy, Illyria, Dalmatia, the south of France, Corsica, Sardinia, the Balearic Isles, Spain, Portugal, Madeira, the north of Africa, Palestine, Syria, Turkey, Tartarian Caucasus, Greece, the islands of the Archipelago, and the Ionian Isles: many, also, that are natives of Britain, and some of the still more northern countries of Europe.

To those who wish to learn the geographical localities of many species about the coasts of the Mediterranean, I would recommend the perusal of a very interesting paper in the *Memoires du Museum d' Histoire Naturelle*, tom. 14. 1827, entitled "Enumeratio Plantarum quas in Insulis Balearibus collegit (anno 1824) I. Cambessedes, earumque circa mare Mediterraneum distributio Geographica."

Dr. Presl, who has lately published the first volume of his able *Flora Sicula*, arranged according to the natural orders, divides the vegetation of Sicily into the *seven* following regions:—

1. The *Subtropical Region*, having an altitude from 0—100 Parisian feet, includes the cultivated exotics from the Brazils, Cape of Good Hope, &c., as Erythrína Corallodéndron, Phœnix dactylífera ; some Mesembryánthema, Cacti, Mimósæ, Acáciæ, &c.

2. The *Hilly Region*, which commences also with the former, and extends as high as 2,000 ft.

3. The *Lower Woody Region*, or *Region* of the *Oak* and *Chestnut*, with an elevation from 2,000 to 4,000 ft.

4. The *Higher Woody Region*, or *Region* of the *Beech* and *Pine*, having a height from 4,000 to 6,000 ft.

5. The *Subalpine Region*, extending in altitude from 6,000 to 7,500 ft.

6. The *Alpine Region* is elevated from 7,500 to 9,000 ft.

7. The *Region* of *Lichens*, extends from 9,000 to 9,200 ft., or as high as the Casa Inglese. The *three* last divisions are only to be found on Mount Etna.

It may not be improper to give the heights of some of the Sicilian mountains above the sea, according to Capt. Smyth, most of them being celebrated localities for plants :—

	Feet
Summit of Mount Etna	10,874
Foot of the Cone	9,760
Casa Inglese	9,592
Philosopher's Tower	9,467
Highest part of the Woody Region	6,279
The Goat's Cave	5,362
Convent of St. Niccolo dell' Arena	2,449
Lingua Grossa	1,725
Caltabellata, highest Peak of the Range	3,690
Monte Cuccio, near Palermo	3,229
Mount Scuderi, Neptunian Range	3,190
Dinnamare over Messina	3,112
Mount Vennerata, near Taormina	2,925
Mount Rosso, near Buscemi	2,791
Toretta Peak, Vale of Palermo	2,748
Mount Griffone, near Palermo	2,679
Mount Calogero, near Termini	2,671
Castellaccio, a ruin above Monreale	2,481
Monte Lauro, near Buccheri	2,404
Mount Bonifacio, near Alcamo	2,213
Meraglia Peak, near Palermo	2,145
Mount St. Julian, the former Eryx	2,184
Mount St. Severo, near Caronia	2,071
Mount Pellegrino, Telegraph	1,955
Capo di Gallo, near Palermo	1,692
St. Martino, Convent	1,659
Mola Village, above Taormina	1,585
Highest of the Gibel manna hill	1,519
Moorish Castle at Taormina	1,305
Citadel of Cocalus at Girgei	1,240
Parco monastery	1,115
Mount Calogero at Sciacca	1,035
Ancient Theatre at Taormina	847
Bocca di Falco, near Palermo	430

The soil of Sicily is for the most part remarkably rich and fertile, and consists of a great variety of earths, and is often of great depth : but agriculture is unfortunately in a very primitive state, and, therefore, it is difficult to conjecture what the produce might be, if a good system were enforced.*

THE SHAMROCK OF IRELAND.

Mr. Bicheno, on the 16th March last, read a paper before the Linnæan Society of London, "on the plant intended by the

* From a valuable paper on Sicily, in the Mag. Nat. Hist.

Shamrock of Ireland," in which he attempted to prove, by botanical, historical, and etymological evidence, that the original plant was not the white clover, which is now employed as the national emblem. He stated, that it would seem a condition at least suitable, if not necessary, to a national emblem, that it should be something familiar to the people,—and familiar, too, at that season when the national feast is celebrated. Thus, the Welsh have given the *leek* to St. David, being a favourite oleraceous herb, and the only green thing they could find on the 1st of March; the Scotch, on the other hand, whose feast is in the autumn, have adopted the *thistle*. The white clover is not fully expanded on St. Patrick's day, and wild specimens of it could hardly be obtained at this season. Besides, it was probably, nay almost certainly, a plant of uncommon ocurrence in Ireland during its early history, having been introduced into that country in the middle of the seventeenth century, and made common by cultivation. He then referred to several old authors, to prove that the *shamrock* was eaten by the Irish; and to one who went over to Ireland in the sixteenth century, who says it was eaten, and was a *sour* plant. The name also of Shamrock is common to several trefoils, both in the Irish and Gaelic languages. Now the clover could not have been eaten, and it is not sour. Taking, therefore, all the conditions requisite, they are only found in the wood-sorrel, *oxalis acctosella*. It is an early spring plant: it was and is abundant in Ireland: it is a trefoil; it is called *shamrog* by the old herbalists, and it is sour; while its beauty might well entitle it to the distinction of being the national emblem. The substitution of one for the other has been occasioned by cultivation, which made the wood-sorrel less plentiful, and the Dutch clover abundant.*

ON THE INFLUENCE OF WATER ON THE RESPIRATION OF FISHES.

By M. Flourens.

WATER may act on the respiration of fishes chemically, physically, or mechanically. In a memoir lately read before the Academy of Sciences (12th April,) M. Flourens confined himself to the mechanical influence of water, which has not been heretofore sufficiently attended to. He has observed, that water acts on the branchiæ or gills by separating their laminæ to facilitate the access of the air; a result which is founded on numerous experiments.

It is known that fishes die almost immediately in the air. M. Flourens supposed that this arose from a true asphyxia occasioned by the sinking of the branchiæ, no longer supported by the interposition of water between their laminæ; and this idea has been confirmed in prolonging the life of fishes by artificially

* Literary Gazette.

keeping the laminæ in the state of separation which the water produces. On the other hand, by compressing the branchiæ under water similarly to their condition in the air, death occurred as quickly as in the latter fluid. With the view of proving that water exercises only a mechanical action on the respiration of fishes, M. Flourens has put many of these animals into wine. They did not live as in water, but their death was much longer delayed than in air. He explained this action of the wine, by remarking that this liquid contains much less air than the water.*

EFFECT OF LIGHT ON PLANTS.

VEGETABLE physiology is indebted to Senebier, Saussure, De Candolle, and others, for numerous researches on this interesting subject. M. Glocker, in 1820, published at Breslaw, a work in which he has brought together all the facts known, and even the most plausible hypotheses. M. Leuchs has also lately added some interesting experiments on the same subject. It is known that the solar light, by favouring the assimilation of carbonic acid gas in plants, gives them the faculty of becoming green, and of forming the volatile and aromatic principles. These conditions are necessary to their flowering and fructification, insomuch that ripe seeds have never been obtained from plants kept in darkness. If, on the contrary, bleached plants are exposed to the sun for three, four, or five hours, they become as intensely green as if they had been reared in the sun. Vegetables reared in the open air, become pale and fade in two or three hours, if they are transplanted to a dark place: but those which, after growing in the shade, have been exposed for some time to the sun, can no longer support the privation of light; and water, impregnated with camphor or essential oil, which is highly favourable to vegetation in other circumstances, does not prevent them from fading and perishing. The entire privation of light is therefore very hurtful to plants. M. Leuchs concludes from this, that, without the light of the moon and stars, vegetables would be destroyed by the influence of the night. The light of a lamp is capable of replacing that of the sun, though in a very imperfect manner. The plant becomes green, and directs itself towards the lamp, as M. Leuchs has shown by a beautiful experiment. He has made comparative observations on the germination of seeds deposited in an open vessel, in another covered with a single leaf of paper, and in a third covered with two leaves. Those of the first vessel presented the least external developement; but, on being dried, they afforded the greatest quantity of solid parts. Those of the second vessel were much more developed, but their tissue was looser and more watery. This difference was still more decided in the plants of the third vessel. The length and

* Edin. Journ. of Nat. and Geo. Science.

wateriness of these plants, therefore, increased in the ratio of the diminished action of light. The tissue of various plants seems to become more or less watery, according to the nature of the plants themselves, when they are deprived of light. Proceeding from this fact, M. Leuchs is desirous that the influence of different quantities of light on vegetation should be determined. He himself has observed, in a moist cellar, lighted by a torch, that the plants placed nearest the flame also contain most solid parts on being dried. The results of the observations which he details are pretty uniform, and afford reason to hope that the law by which the action of different quantities of light on the vegetable is regulated, may yet be determined. Lastly, according to experiments detailed in his memoir, the light reflected by mirrors has a very beneficial influence on plants. M. Leuchs explains by this how certain places are fertilized by the reverberation of the light on rocks in their neighbourhood.*

COLOUR OF WATER AND ICE.

Not only the water, but also the ice of different rivers has a peculiar colour; and this appears to depend not on accidental causes, as conjectured by Davy,† because, if so, it could not be the same every year. "I have," says Ritter von Wurzer, in Karsten's Archives, b. xviii. p. 103, "often observed this in the ice of the Rhine, which is always *bluish;* while, on the other hand, the ice of the Moselle is always *greenish.* The ice of the small rivers that pour into the Lower Rhine, for example the Ruhe, &c. is either *white*, or only *pale greenish.* More than seventy years ago, Leidenfrost first remarked this circumstance. This difference of colour is so striking, that the boatmen guide themselves by it, as they know by it whether it is Rhine or Moselle ice they have to do with. That decaying vegetable matter is the cause of the green colour is by no means evident, for the clear and transparent ice of the Rhine is *sky-blue*, the clear and transparent ice of the Moselle is *green;* and why is this appearance the same, year after year? Why is the water of streams in woods in general not green? Why is the sea-waters green, even in places hundreds of miles from the land? I am not of opinion that iodine and bromine give to sea-water its colour, for those sea-plants which, by their decomposition, afford these substances, does not contain them in an uncombined state. The truth is, we have not hitherto discovered the cause of the colour of ice and water.‡

ORIGIN OF THE AIR OF AIR-VOLCANOES.

An account has been lately published of a salt named *Kniester*

* Bulletin des Sciences Naturelles.

† See Arcana of Science for 1829.

‡ Karsten's Archiv.

Salz, brought from Wieliczka by Dr. Boué, which contains much carburetted hydrogen. When dissolved in water, the carburetted hydrogen escapes; hence it is inferred that the gas evolved in many salt-mines, and also in salses in air-volcanoes, may have this origin.*

LARGE TREE IN MEXICO.

By a Resident in Mexico.

THIS tree is situated in the churchyard of Santa Maria de Tesla, two and a half leagues west of Oaxaca, on the road to Guatemala per Tehnantepec; and there are five or six other enormous trees of the same class surrounding the church, equal in size to the largest trees of the like class now growing in Chapultepec or Xmiquilpan, in the state of Mexico; but the tree above referred to, standing within the walls surrounding the church of Santa Maria, is the tree that, from its enormous bulk, excites the wonder of all who have seen it: it is called by the natives *Sabino.* During the month of May last I breakfasted under it, and measured the circumference by the cord or lasso of my horse I had then with me. It required five lengths of the lasso and about one half vara more to complete its span. Upon my return to Oaxaca, I measured the length of my lasso, which was exactly 9 varas; so that I estimate the circumference to be 46 varas of fair measurement, as I made allowance, (with my servant, who assisted me in spanning the tree) for the protuberances in many parts thereof. The largest tree in Chapultepec is about 17 varas in girth; and the remainder of the trees of the same class in Santa Maria are about the same size, or somewhat smaller. [A Mexican vara is 33½ English inches; so that the large tree is 127 feet in circumference.] The large tree, I think, may be about 120 feet high; and comparatively to its bulk, has but little foliage, less than the smaller trees surrounding it. It moreover appears in the prime of its growth, and has not a single dead branch on it. The enormous branches that spring out of the trunk, some 30 feet high, make it appear (as all these trees do) as if there were three or four trees united. I have, however, no doubt that it is one entire tree, as one entire bark encircles the grand trunk.

This tree is an object of considerable veneration with the natives of the village, and the neighbouring Indians; who in former times, it is said, offered sacrifices to it. It is mentioned by Cortez, in his history of the conquest of Oaxaca, as at that time the greatest wonder he had seen, and the shade of which served for the whole of his little army of Europeans.

Enormous as the size of this tree may appear, I am credibly informed that there yet exist, in the road to Guatemala, by the

* Jameson's Journal.

ancient city of Palenque, now in ruins, trees of the same class, equal to this in size, if not somewhat larger.

The following notice of the trees at Chapultepec, mentioned above, is from Mr. Ward's *Travels in Mexico*, vol. ii. p. 230 :—

In the gardens of Chapultepec, Mexico, the first object that strikes the eye is the magnificent cypress (Sabino Ahuahuete, or Cuprèssus disticha,) called the cypress of Montezuma. It had attained its full growth when that monarch was on the throne (1520,) so that it must now be, at least, 400 years old; yet it still retains all the vigour of youthful vegetation. The trunk is 41 feet in circumference; yet the height is so majestic as to make even this enormous mass appear slender. On a close inspection, it appears to be composed of three trees, the trunks of which unite towards the root so closely as to blend into one. This circumstance, however, led us to give the preference to a second cypress, not quite equal to the first in circumference (it is 38 feet in girth,) but as old, as lofty, and distinguished by a slight curve towards the middle of the stem, which gives it a particularly graceful appearance.*

ON RAINING TREES.

By John Murray, Esq. F.S.A. F.L.S. F.G.S. &c.

THE secretions of trees form a curious part of their physiology, but the influence of vegetation on the atmosphere seems to have been entirely overlooked, at least as far as it regards its meteorology.

In the case of that curious genus of plants the Sarracènia, in which the S. adúnca is most conspicuous, the foliaceous pouch is a mere reservoir, or cistern, to catch and retain the falling dew or rain. In the Nepénthes distillatòria, or pitcher plant, the case is different; and analysis proves it to be an evident secretion from the plant itself, independent altogether of the fact that it is found in the pitcher before the lid has yet opened. I may here state, *en passant*, that the results I obtained from a chemical examination of this liquid differ materially from those of Dr. Edward Turner. The Córnus máscula is very remarkable for the amount of fluid matter which evolves from its leaves, and the willow and poplar, when grouped more especially, exhibit the phenomenon in the form of a gentle shower. Prince Maximilian, in his *Travels in the Brazils*, informs us that the natives in these districts are well acquainted with the peculiar property of those hollow leaves that act as recipients of the condensed vapours of the atmosphere; and, doubtless, these are sources where many tropical animals, as well as the wandering savage, sate their thirst "in a weary land." The Tillándsia exhibits a watery feature of a different complexion: here the entire interior is

* Quoted in the Mag. Nat. Hist.

charged with such a supply of liquid, that, when cut, it affords a copious and refreshing beverage to man. That these extraordinary sources of "living springs of water" are not unknown to inferior creation, is a fact interestingly confirmed to us in the happy incidents detailed by Mr. Campbell, in his *Travels in South Africa*, where a species of mouse is described to us, as storing up supplies of water contained in the berries of particular plants: and, in Ceylon, animals of the Símia tribe are said to be well acquainted with the *Nepénthes* distillatória, and to have frequent recourse to its pitcher. The mechanism of the "rose of Jericho" (Anastática hierochuntina) shows the susceptibility of plants to moisture in a very remarkable manner; and I have submitted some experiments made with this extraordinary exotic, the inhabitant of an arid sandy soil, to the Horticultural Society of London. That succulents should be found clothing in patches the surface of the burning desert is a phenomenon not the least wonderful in the geógraphical history of vegetation.

In Cockburn's *Voyages* we find an interesting account of a tree in South America, which yielded a plentiful supply of water by a kind of distillatory process: this tree was met with near the mountainous district of Vera Paz. The party were attracted to it from a distance, the ground appearing wet around it; and the peculiarity was the more striking, as no rain had fallen for six months previous. "At last," says he, "to our great astonishment, as well as joy, we saw water dropping, or, as it were, distilling fast from the end of every leaf of this wonderful tree; at least it was so with us, who had been labouring four days through extreme heat without receiving the least moisture, and were now almost expiring for want of it." The testimony of travellers is too often enshrined among the fabulous; and their credentials either altogether rejected by some or at least received "cum grano salis." Bruce of Kinnaird forms the most remarkable example of this kind, and the caricature of Baron Munchausen consigned the whole to sarcasm and ridicule; and yet the time is come when the more remarkable circumstances and phenomena mentioned by this traveller, verified by Lord Valentia, Mr. Salt, &c., are received as well accredited facts. The curious phenomenon mentioned by Cockburn finds an interesting and beautiful counterpart in two plants; namely, the *Cálla* æthiópica and Agapánthus umbellàtus, in both of which, after a copious watering, the water will be seen to drop from the tips of the leaves; a phenomenon, as far as I know, not hitherto recorded.

The great rivers of the continent of Europe have their source of supply in the glaciers; but many of the rivers in the New World owe their origin to the extensive forests of America, and their destruction might dry up many a rivulet, and thus again convert the luxuriant valley into an arid and sterile waste; carried farther, the principle extends to the great features of the

globe. What the glaciers effect among the higher regions of the Alps, the *Pinus Cémbra* and *Làrix* commùnis accomplish at lower elevations; and many a mountain rivulet owes its existence to their influence. It rains often in the woodlands when it rains nowhere else; and it is thus that trees and woods modify the hygrometric character of a country: and I doubt not but, by a judicious disposal of trees of particular kinds, many lands now parched up with drought, as, for example, in some of the Leeward Islands, might be reclaimed from that sterility to which they are unhappily doomed.

In Glass's *History of the Canäry Islands* we have the description of a peculiar tree in the Island of Hierro, which is the means of supplying the inhabitants, man as well as inferior animals, with water; an island which, but for this marvellous adjunct, would be uninhabitable and abandoned. The tree is called *Til* by the people of the island, and has attached to it the epithet *garse*, or *sacred*. It is situated on the top of a rock terminating the district called *Tigulatre*, which leads from the shore. A cloud of vapour, which seems to rise from the sea, is impelled towards it; and being condensed by the foliage of the tree, the rain falls into a large tank, from which it is measured out by individuals set apart for that purpose by the authorities of the island.

In confirmation of a circumstance *prima facie* so incredible, I have here to record a phenomenon, witnessed by myself, equally extraordinary. I had frequently observed in avenues of trees, that the entire ground engrossed by their shady foliage was completely saturated with moisture; and that during the prevalence of a fog, when the ground without their pale was completely parched, the wet which fell from their branches more resembled a gentle shower than any thing else; and in investigating the phenomenon which I am disposed to consider entirely *electrical*, I think the *elm* exhibits this feature more remarkably than any other tree of the forest. I never, however, was more astonished than I was in the month of September, last, on witnessing a very striking example of this description. I had taken an early walk, on the road leading from Stafford to Lichfield: a dense fog prevailed, but the road was dry and dusty, while it was quite otherwise with the line of a few *Lombardy poplars:* for from them it rained so plentifully, and so fast, that any one of them might have been used as an admirable shower bath, and the constant stream of water supplied by the aggregate would (had it been directed into a proper channel) have been found quite sufficient to turn an ordinary mill.*

RUSSIAN DIAMOND MINES.

When, in the year 1826, Professor Engelhardt undertook a scientific journey into the Uralian Mountains, he remarked that

* Mag. Nat. Hist.

the sands in the neighbourhood of Koushra, and those of the platina mines at Nigny-Toura, strikingly resembled the Brazilian sands in which diamonds are found. Baron Humboldt, during his late residence in the same country, confirmed this resemblance; and examinations having been made according to his advice, a young countryman who was employed in washing the auriferous sand, on the grounds of the Countess Polier, discovered a diamond on the 20th of June last, which was nothing inferior to those of Brazil; soon after, many others were found superior in weight to the first. Thus Russia has added this source of riches to those which of late years it has obtained in the form of gold and platina mines from the Ural chain of mountains.*

SEAT OF THE SENSE OF TOUCH.

The presence in insects of the ganglion which represents the brain, is not absolutely necessary for the existence of the sense of touch. After decapitation they feel on the surface, and in their limbs, by means of their other ganglions, such impressions as may be made on them. The spinal marrow of reptiles, young birds, and young mammiferous animals, seems also capable, after the destruction of the brain, of being modified by irritations, of feeling them, and of occasioning, in consequence thereof, durable and calculated movements, which are not to be confounded with those convulsive and fugacious motions that are attributable solely to irritability. M. Calmeil thinks that this faculty of the spinal marrow is probably diffused throughout its whole extent. Further, it is probable that in the natural state of our functions the brain is the sole centre of irritability, and that the spinal marrow only becomes sensible when the brain ceases to exist. The co-ordination of our voluntary motion is doubtless attributable only to the brain †

VISHA, VISH, OR BIKH—POISONOUS ROOT OF INDIA.

(From Dr. Wallich's splendid Work on East India Plants.)

This dreadful root, of which large quantities are annually imported, is equally fatal when taken into the stomach, or applied to wounds, and is in universal use for poisoning arrows; and there is too much reason to suspect, for the worst of purposes. Its importation would indeed seem to require the attention of the magistrates. The Gorkhalese pretend that it is one of their principal securities against invasion from the low countries; and that they would so infect all the waters on the route by which an enemy was advancing, as to occasion his certain destruction. In case of such an attempt, the invaders, no doubt, ought to be on

* Revue Ency.

† Med. Journ.

their guard; but the country abounds so in springs that might be soon cleared, as to render such a means of defence totally ineffectual, were the enemy aware of the circumstance. This poisonous species is called *Bish* or *Bikh*, and *Haydaya Bish* or *Bikh*; nor am I certain whether the *Metha* ought to be referred to it, or to the foregoing kind. By referring to the experiments of Professor Orfila, in his General Toxicology, and of Mr. Brodie, in the Philosophical Transactions, it will be seen that the symptoms produced by the *Aconitum napellus* are very similar to those produced by the *Aconitum ferox.* Hence, then, it is most probable, that both species contain the same active principle; but the *A. ferox* must contain it in much greater quantity, as its effects are so much more powerful. Indeed the alcoholic extract of this root appears to be nearly equal in power to *Strychnine, Upas antiar, Upas tieutc,* and *Woorara* poisons. That it is equal in power to *Strychnine,* I can speak from numerous experiments which I have made with this latter; but with respect to the activity of the *Upas* and *Woorara* poisons, I can only speak from the experiments of Orfila, Brodie, and others.

MINES OF SILVER OR ARGENTIFEROUS LEAD IN THE CAUCASUS.

Dr. Meyer, a member of the scientific expedition sent to the Caucasus by the Imperial Academy of Sciences of St. Petersburg, has informed the Academy that M. de Engelhardt believes he has found in the Caucasian mountains, about 120 versts from the fort Grosnaia, rich mines of silver or of argentiferous lead, on whose existence the academician Hamel made a communication to the Academy last year.*

ON THE FORMS AND RELATIONS OF VOLCANOES,

From the Observations of Leopold de Buch; by Mr. Elie Beaumont.

The manner in which the effused or upraised craters have been formed, appears to be at the present day one of the principal problems of geology. Its solution, which can only be obtained by the means proposed by Mr. Elie Beaumont, by a study of the forms and relations of volcanoes, would immediately give the key of volcanic phenomena, and would probably also lead us to find that of a much more important phenomenon—the upraising of chains of mountains. De Buch first pointed out the fact, that in countries where all the rocks present more or less completely the characters of volcanic products, many cavities which have the form of craters, have never been craters of eruption. The oxidated crust of the earth has been elevated by the action of an internal power; a crater of effusion, (*cratère de soulevement,*) has been formed, but no permanent canal of communication has

* Bull. de Soc. Geo.

established itself in this opening between the interior of the globe and the surface. The volcanic action which has produced this imperfect volcano often makes way at a short distance, giving birth to little craters of eruption, as on the island of Palma, which are generally on a straight line which passes through the centre of the crater of effusion.

There is a connexion, but not an identity, between the causes of the mechanical action which produced the craters of effusion, and those which continue to sustain volcanic phenomena. There can be no doubt, from the discovery of primitive blocks in the cleft which gives access from Caldera to the island of Palma, that the mechanical action which produced the craters of effusion developed itself beneath the primitive rocks. It was already known, from the time of Dolomieu, that the seat of volcanic eruptions was also placed beneath the same rocks.

Craters of effusion have seldom been produced in an isolated manner; on the contrary, many have formed themselves in the neighbourhood of one another, either by grouping themselves around a central and principal volcano, or forming themselves in a line whose direction is in relation to the great accidents of the soil of the country. These centres of eruption thus grouped, are not independent of one another. The periods of eruption may be the same or different; and by comparison of the catalogue of eruptions, we find that Vesuvius, Ætna, and Stromboli are not only distinct volcanoes, but belong to separate groups, while the volcanic phenomena of the Canary Islands depend on one another. Each of the Canary Islands, nevertheless, consists of a central crater of effusion of a considerable diameter, on whose external ridges basaltic columns or *fuzes* rise on all sides. These islands cannot be the fragments of a great continent. They are a re-union of islands which have been elevated, the one beside the other, and in an insulated manner, from the bottom of the sea. All the volcanoes in the globe may be divided into two classes—central volcanoes, and volcanoes in line; and these two classes do not differ from one another in composition, or in products. The former always constitute the central point of a great quantity of mouths of effusion, almost equally scattered in every direction. If we consider chains of mountains as masses which have been elevated upon large clefts by the action of melaphires (black or augitic porphyries,) we shall understand to a certain degree the situation of volcanic mouths. Effused islands with craters of effusion often lay the foundation of the first class; this is probably often the case in the South Seas.

Of volcanoes in lines Mr. Elie Beaumont mentions the suite of islands in the Grecian Archipelago from the isthmus of Corinth to the island of Santorin. Such, also, are the volcanoes of the Archipelago of Java, the Straits of Sunda, and the Cordillera of the Andes.

In speaking of volcanoes we are always led to speak of tra-

chytes and basalts. Volcanic products, trachytes, and basalts are three neighbouring groups, but distinct, if non-stratified rocks. Some lavas, as those of the island of Lancerota, might be taken for basalts. Basalts are sometimes as intimately connected with conglomerate as trap rocks with the tufas, which are inserted in their masses.

Basalts, like trap rocks, appear to have been raised to the surface of the earth by irregular openings, or by clefts in the solid crust, accompanied by considerable quantities of incoherent fragments, which have remained interjected, under the form of conglomerates, between the different masses, when these are stretched over the pre-existing soil.

Basalts of a more recent origin have often been cast up through the mineral crust of the globe, in points previously marked out, in the disposition of the elements of our globe, to present craters of effusion, in the midst of which cones of true volcanoes of eruption would show themselves.

Trachytic masses, accompanied by their conglomerates, in producing themselves under the form of cones, of domes, or of rounded masses, more or less irregular, appear to have prepared the plan for volcanic centres.

We shall give the geological results of these researches at a future oppportunity.*

SILVER MINES IN SWEDEN.

An inhabitant of Stockholm, Mr Segerman, has communicated to the Board of Finance of Sweden, a memoir, in which he states that he has discovered, in the mountains of the province of Calmar, mines of silver whose veins are many miles in extent, and whose produce will suffice to redeem all the Swedish bills without any need of a foreign loan.†

NOTICE OF CURIOUS MECHANICAL FEATS OF A SMALL SPECIES OF SPIDER, (ARANEA EXTENSA?)

By the Rev. William Turner.

On the 1st of the present month, I attended, with several other gentlemen the trial of a new steam-engine, built by Mr. Robert Stephenson, for the Liverpool Railway; at the close of which our friend and associate, Mr. Mackreth, observed to me, that though Mr. S. was a great mechanic, he could show me one still more extraordinary. On calling upon him the next morning, he brought out a tumbler glass, which he had inverted on the table over the sprig of a laurustinus bush, on which he had observed a very small spider. Supposing that it might want air, he had slipped under the edge of the glass a small roll of paper. In

* Edinburgh Journ. † Bull. de Soc. Geo.

less than three days the little animal had filled the interior of the glass with minute, almost invisible, threads, by means of which it had raised the sprig into the middle of the glass; and, not content with this, had raised also the coil of paper, which by some accident had slipped from under the edge; after this, it laid, upon one of the upper leaves, a large ball of eggs, and having thus completed the ultimate object of its existence, it died, and fell into the meshes of its own web. This glass, with its contents, I have now, by Mr. Mackreth's permission, the honour of exhibiting, to the Society. How this little artist should have accomplished the herculean task of raising a weight several hundred times greater than itself, and for what purpose it should have done this, are questions which may well deserve consideration. I have not observed any similar feat recorded of spiders in the volume on Insect Architecture in the *Library of Entertaining Knowledge*.*

CUTICULAR PORES OF PLANTS.

It is well known to botanists that the cuticle of most plants is furnished, especially on the leaves, with minute organs, the function of which is a matter of conjecture, and the actual structure of which has given rise to much difference of opinion. These organs have received the names of pores, or glands, or stomata, according to the views of different observers; and while one class of botanists has considered them of unknown function and structure, others have contended that they are of the nature of pores, and that their office was, according to the one, to facilitate evaporation—to the others, to assist in the process of respiration. Their function is obviously of so obscure a nature, that no direct experiments are likely to demonstrate exactly what it is; but their structure is a point upon which observation may be expected to cast some light. Mr. Bauer long ago represented these organs in the wheat, as perforations opening into a minute subcutaneous cavity, and as destined to afford a direct passage into the interior of a plant for those minute fungi, whose ravages are so well known in the form of what the farmers call the mildew in corn. Other observers have, however, doubted whether the supposed perforations always existed; and Mr. Lindley, in his lectures in the University of London, has repeatedly expressed his difficulties upon the subject. The fact is, that they are so minute, the tissue of which they consist is so exceedingly transparent, and it is so difficult to examine them, except by the aid of transmitted light, that it is not, perhaps, possible to determine positively in all cases whether a perforation exists or not. Mr. Robert Brown has recently published some observations upon them, from which it is to be collected that, in the opinion of that distinguished ob-

* From the Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne. Vol. I. Part I.

server, the stomata are rather of the nature of glands than of pores, and are undoubtedly in many cases imperforate—evidently having in their disc a membrane which is more or less transparent, sometimes opaque, or very rarely coloured. The existence of colouring matter in the stomata is the only circumstance that could have enabled an observer to prove their imperforate nature; for, in colourless membranes, such as those of Crinum, in which the stomata are particularly large, the best microscopes, employed under the most favourable circumstances, show nothing but an apparent orifice, closed up occasionally by the dilatation of two glandular bodies placed beneath it. Mr. Brown states, what was certainly a very unexpected fact, that these bodies will often, in proteaceous plants, by their figure and position, or magnitude, with respect to the meshes of the cuticle, determine the limits or even affinities of genera, or natural sections.*

SEAT OF THE SENSE OF TASTE.

THE following general experiments and conclusions are from a work on the seat of this sense by MM. Guyot and Admyrauld. 1. If the anterior extremity of the tongue be inclosed in a very soft, flexible case of parchment, so as to cover it completely, jelly, and in general all bodies, may be introduced into the mouth, and crushed between the teeth without any taste being distinguishable. The same effect is obtained also by retaining the tongue apart from the cheeks or teeth; sapid objects placed beyond its action give no sensation of taste. The tongue, therefore, is the essential organ of taste; the lips, palate, cheeks, and gums have no power of this kind.

2. Nevertheless, if the tongue be entirely covered, and very sapid substances be swallowed, a little taste is perceived at the posterior part of the *velum palatinum.* If the palatal arch be covered with parchment, a sapid body produces its ordinary effect upon the tongue. If a little piece of extract of aloes be fixed upon the end of a rod, and passed over the palate and the roof of the mouth, it produces no other sensation than that of touching; but on the anterior and upper part of the soft palate there is a small portion of surface, not having definite limits, where the impression of sapid bodies is very sensible; the back part of the mouth does not partake in this property, so that this small portion of the palatal vault with the tongue forms the organ of taste.

3. If the tongue be covered with parchment, pierced at the middle of its back surface, sapid bodies applied to the part produce no taste, until, being dissolved in the saliva, they gain access to the edge of the tongue. Extract of aloes passed over various parts of the tongue produce sapid impressions within

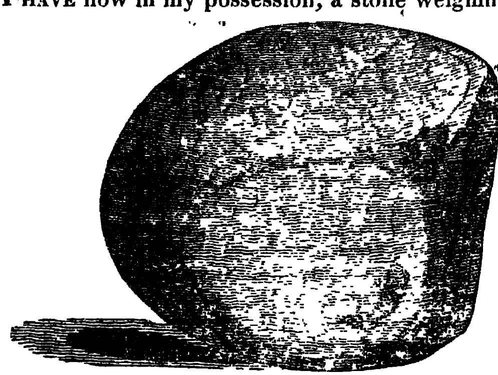
* Journ. of the Royal Institution.

a space of only one or two lines at the sides, three or four at the point, and within a curved space at the back Hence this part of the tongue and the lateral portions are the especial organs of taste in deglutition; the portion of the soft palate already mentioned prolongs the sensation.*

NOTICE OF STONES FOUND IN THE STOMACHS OF PIKE.

By the Rev. W. T. Bree, M. A.

I HAVE now in my possession, a stone weighing $4\frac{3}{4}$ oz. taken out of the stomach of a pike, which was caught by a friend of mine, while trolling in the Earl of Craven's water at Coomb Abbey. The fish weighed about $3\frac{1}{2}$lbs. and being in good condition, did not appear to be incommoded by this internal incumbrance. The



stone, I should observe, is not a concretion formed by accident or disease, such as is sometimes found in the stomachs of cows, &c. but an ordinary pebble, of a somewhat flat rounded shape, and bearing the appearance of having been broken at some remote period on two of its sides. Since its fracture, however, the pebble has been well bouldered, so that it now presents no sharp projecting edges, nor any very considerable irregularity of surface.

I recollect having formerly seen, at Packington Hall, the seat of the Earl of Aylesford, another pebble considerably larger (if my memory serves me) than the present one, which had also been found in the stomach of a pike caught near that residence. I have conversed on this subject with an intelligent friend and a great fisherman, who assures me that several instances of the same kind have come under his own knowledge: one stone in particular, which he took himself out of the stomach of a pike, he kept as a curiosity for several years, and he describes it as having been full half as large as his fist or more. The fact, in short, of the existence of pebbles in such situations is unquestionable, and from the above instances appears not to be of very unusual occurrence. There can be as little doubt that these

* Bib. Univ.

pebbles have entered the stomach of the fish through the mouth. But the question is, how came the pike to swallow such indigestible matter? It has been suggested to me in answer, that the fish, in seizing its prey, might along with it have accidently picked up the stone from the bottom, and swallowed both together. But is not the pike too good a marksman to take up so large a substance *accidentally* with his food? and may not some more probable way of accounting for the fact be devised? The voracity of the pike—the river shark, or tiger of the fresh water, as he may be called—is almost proverbial. It is well known that this fish, when in the humour for taking its prey, will strike almost without discrimination at whatever object it sees moving in the water. It is not improbable, therefore, that the stones in question having been thrown into the water by some person passing by, may have been seized by the pike while in the act of sinking to the bottom, and at once gorged for more digestible food.*

LEARNED POODLES.

From the Magazine of Natural History.

Two very remarkable savans now (March, 1830,) divide the attention of the French public with the romantic tragedy of Hernani by Victor Hugo.

They are poodles from Milan, where they have received their education; the elder, named Fido, is white, with some Black patches on his head and back, and the younger, who is called Bianco, is also white, but with red spots. Fido is a grave and serious personage, walks with dignity round the circle assembled to see him, and appears much absorbed in reflection. Bianco is young and giddy, but full of talent when he chooses to apply it. Owing to his more sedate disposition, Fido, however, is called upon to act the principal part of the exhibition: a word is dictated to him from the Greek, Latin, Italian, German, French, or English language, and selected from a vocabulary where fifty words in each tongue are inscribed, and which altogether make three hundred different combinations. An alphabet is placed before Fido, and from it he takes the letters which compose the given word, and lays them in their proper order at the feet of his master. On one occasion he was told to spell the word Heaven, and he quickly placed the letters till he came to the second e, he stood for an instant as if puzzled, but in a moment after he took the e out of the first syllable, and put it into the second. His attainments in orthography, however, are not so surprising as those in arithmetic; he practises the four rules with extraordinary facility, arranges the double ciphers as he did the double vowels in the word heaven, and rarely makes

* Mag. Nat. Hist.

an error. When such does occur, his more thoughtless companion is called in to rectify it, which he invariably does with the greatest quickness, but as he had rather play than work, and pulls Fido by the ears to make him as idle as himself, he is quickly dismissed. One day the steady Fido spelt the word Jupiter with a b, instead of a p, after the manner of the Germans; Bianco was summoned to his aid, who, after contemplating the word, pushed out the b with his nose, and seizing a p between his teeth, put it into the vacancy. Fido is remarkable for the modest firmness with which he insists upon his correctness when he feels convinced of it himself; for a lady having struck a repeating watch in his ear, he selected an 8 for the hour, and a 6 for the three quarters. The company present, and his master called out to him he was wrong; he reviewed his numbers, and stood still, his master insisted, and he again examined his ciphers, after which he went quietly, but not in the least abashed, into the middle of the carpet, and looked at his audience; the watch was then sounded again, and it was found to have struck two at every quarter, and Fido received the plaudits which followed with as gentle a demeanour as he had borne the accusation of error.

One occupation seems to bring the giddy Bianco to the gravity of the elder savant, and when the spectators are tired of arithmetic and orthography, the two dogs either sit down with each other to écarté, or become the antagonists of one of the company. They ask for, or refuse cards, as their hands require, with a most important look, they cut at the proper times, and never mistake one suit for another. They have recourse to their ciphers to mark their points, and on one occasion Bianco having won, he selected his number, and on being asked what were the gains of his adversary, he immediately took an 0 between his teeth, and showed it to the querist; and both seemed to know all the turns of the game as thoroughly as the most experienced card-players.

All this passes without the slighest visible or audible sign between the poodles and their master, the spectators are placed within three steps of the carpet on which the performance goes forward; people have gone for the sole purpose of watching the master; every body visits them, and yet no one has yet found out the mode of communication established between them and their owner. Whatever this communication may be, it does not deduct from the wonderful intelligence of these animals; for there must be a multiplicity of signs not only to be understood with eyes or ears, but to be separated from each other in their minds, or to be combined one with another, for the various trials in which they are exercised.

I have seen learned pigs and ponies, and can, after these spectacles, readily imagine how the extraordinary sagacity of a dog may be brought to a knowledge of the orthography of three hundred words; but I must confess myself puzzled by the ac-

quirements of these poodles in arithmetic, which must depend upon the will of the spectator who proposes the numbers; but that which is most surprising of all is the skill with which they play écarté. The gravity and attention with which they carry on their game is almost ludicrous, and the satisfaction of Bianco when he marks his points is perfectly evident.

I must not omit a very amiable feature in the character of these four-footed savans, which is, that their great superiority of instruction over their brethren has not in the least destroyed their more engaging qualities. Not only are they obedient, but lively, affectionate, and gentle, and have not one particle of conceit, though all Paris sees and admires them.

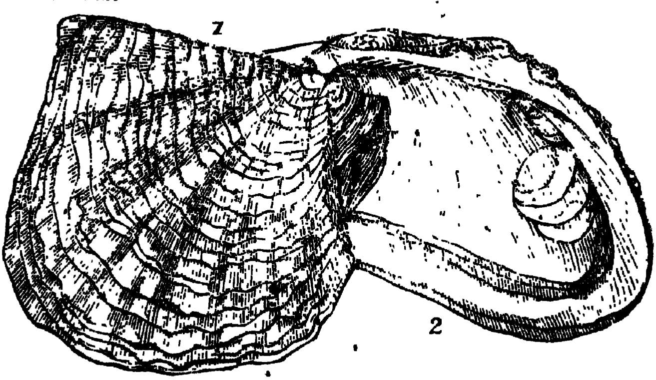
I can vouch for the entire veracity of the above statement, and am, Sir, yours, &c.,—*Sarah Lee, 27, Burton Street, Burton Crescent, March*, 1830.

THE PEARL IN THE OYSTER.

Pearls are not, as poets have feigned,

> "rain from the sky,
> Which turns into pearls as it falls in the sea,"

but they are the morbid secretions of an oyster. Several species of *bivalved* shellfish produce them, but the greater number, the finest and the largest, are procured from the Meleagrina margaritifera *Lamarck* (*see the cut*, 1.) a native of the sea, and of various coasts.



A considerable number are likewise taken from the Unio margaritifera, (*see cut*, 2.) which inhabits the rivers of Europe; and it is singular, as remarked by Humboldt,* that though several species of this genus abound in the rivers of South America no pearls are ever found in them. The pearls are situated either in the body of the oyster, or they lie loose between it and the shell, or, lastly,

* Personal Narrative, vol. ii. p. 282.

they are fixed to the latter by a kind of neck; and it is said they do not appear until the animal has reached its fourth year. They have a beautiful lustre, which must be familiar to the reader, but there is nothing peculiar in their chemical composition, consisting merely of carbonate of lime.*

VOLCANO OF PIETRA MALA.

By a recent Tourist.

In crossing the Apennines we slept at the village of Pietra Mala, about half way between Bologna and Florence, that we might more conveniently see the celebrated volcano, which is about a mile from the village, and to which, attended by a guide, we bent our steps soon after it was dark. As usual we found the account in our guide-book incorrect. Far from illuminating the surrounding mountains, we should not, until quite near it, have taken it for any thing but a candle in a cottage window, or at most a small bonfire; and instead of presenting the extraordinary peculiarity of lighting wood but not heating stones, we found those which lie upon it so hot as not to be held in the hand, and the heat sufficient to roast, very speedily, some chestnuts which my sons chanced to have in their pockets, and which they ate with double glee on account of their cookery at this natural furnace, which has been burning for ages, and which from this circumstance derives its greatest interest. Strictly it has little claim to be called a volcano, there not being the slightest appearance of any crater. It is merely a flame of hydrogen or carburetted hydrogen gas, issuing from crevices in an oval space 6 ft. or 8 ft. long, by 3 ft. or 4 ft. broad, on the same level with the surrounding field, and which space is covered to the height of about a foot with small pieces of indurated clay, or clay slate of a red colour, but in such small quantity, that it seems more probable that they have been purposely thrown there than elevated from below. The flame breaks out here and there from among the stones, to the height of about a foot, the whole having much the appearance of a fire of wood, spread about, on which stones or brick bats had been thrown, whence probably the Italian name for it, *Fuoco di Legno.* Our guide, being a mere boy, could give us no information as to whether the flame is ever extinguished, which one would think might happen from the extremely heavy rains and high winds that occur among the Apennines; whether, as the guide-book asserts, it is more vivid in wet weather, &c. &c.; and I have not had an opportunity of consulting modern Italian works on these and other points, as to the precise chemical composition of the gas, which has doubtless been examined and determined.

Having satisfied our curiosity as far as practicable, we returned

* Mag. Nat. Hist.

to the village by the wretched road we had previously traversed, the state of which, and of the inn are striking proofs of Italian apathy. This so called volcano has been famous for upwards of 250 years, Montagne, in his interesting *Travels in Italy*, in 1580, mentioning his great regret that he had not stopped to examine it: and if the road were good, which it might be made at an expense of less than 50*l*., and the accommodations at the inn ample, scarcely a traveller would cross the Apennines who would not sleep there, in order to visit this remarkable phenomenon. Instead of which, the road is so wretchedly bad, first through a dirty lane, and then over rocks and across ploughed fields, as to be almost impracticable after rain for females; and the inn, though improved since Forsyth described it in such dark colours, is still very indifferent, and the charges exorbitant, so that a great proportion of travellers give up seeing the volcano, and sleep at Coviliajo, a better inn, a few miles further on. How differently would these things be managed in England, or Germany! where, in passing from Bavaria to the Tyrol, we found an excellent gravel walk, purposely made to lead to a cascade some hundred yards from the high road, though not near any inn or village, and no one claimed any thing for the accommodation.*

MILK TREE OF DEMERARA.

Mr. Smith, in a letter to Professor Jameson, published in the Edinburgh New Philosophical Journal, gives an account of a tree discovered by him on an excursion up the river Demerara, possessing most of the qualities ascribed by Humboldt, to the *Palo de Vaca*. It is a different species, however, and is described by Mr. Smith as 30 or 40 feet high, with a diameter at the base of from 16 to 18 inches. The milky juice, which it exudes very copiously on being cut, was thicker and richer than cow's milk, and destitute of acrimony, but without any considerable proportion of nutritive ingredients. It mixes freely with water. Mr. Arnott, who has examined the dried specimen transmitted by Mr. Smith, refers it to the genus *Tabernæmontana*, and proposes naming it *T. utilis*.†

ALIMENTARY TUBERCLE OF VAN DIEMAN'S LAND.

A singular substance has been found at the depth of a foot, or a foot and a half, in the earth of that country. It has not yet been described, but is called *indigenous bread*. It is covered with a thin skin, has a rounded form, like a potato or yam, and is sometimes as large as a man's head. When cut, it appears to be composed of a solid spongy mass, containing a considerable

* Corres. Mag. Nat. Hist. † Quar. Journ. Agricul.

quantity of alimentary matter. No root or fibre has been found adhering to it, so that sometimes it has been thought to be a sort of terrestrial polypus, possessing a principle of animal life. The only indication of its presence which the natives have, is the occurrence of an exceedingly small leaf, which rises from the earth, and is connected with it by very thin and delicate fibres, which break whenever the tubercle is raised.*

DOCILITY AND FACULTIES OF DOMESTIC ANIMALS.

M. DUREAU DELAMALLE lately read a memoir to the Academie des Sciences, in which he endeavoured to prove, 1st, That domestic animals are susceptible of a much higher developement of the intellectual faculties than is commonly supposed; 2dly, That they possess, but within limits which we have not yet been able to determine, instinctive qualities, faculties of imitation, memory, reminiscence, will, deliberation, and judgment; 3rdly, That the individual, and even the race, are capable of being improved in proportion to the knowledge of the classes of people with whom they live, the education which is bestowed upon them, their wants, their dangers, and in general the circumstances in which they are placed; 4thly, That several of the qualities which are looked upon as instinctive are in fact qualities acquired by their faculties of imitation, and that certain acts which are attributed to instinct are elective actions belonging to the domain of intellect, memory, and judgment. The author adduced numerous facts in support of each of these propositions. He showed that domestic animals, and especially dogs, acquire the defects and predominant qualities of the societies or individuals among which they live. Of the facts which tend to prove the influence which imitation exercises on the habits of animals, we may mention the following. M. Dureau Delamalle observed a dog, which having, at the age of two months, been placed with a cat of six months, and brought up along with it, without having any communication with the animals of its own species, acquired the habits and manners of the cat. It bounded in the same manner when it ran, amused itself with rolling round bodies with its feet, played with dead mice, and rubbed its head and ears, with its feet. The cat, on the other hand, had not been in any degree changed by its intercourse with the dog; and this circumstance must no doubt be attributed to its having a much less propensity to imitate. Many animals really educate their young. Birds of prey, for example, which teach their young not only to fly at and seize their prey, but also to catch it dexterously on the wing. The author has observed falcons and hawks training their young in this manner. I lodged, said he, from 1794 to 1798, in one of the combles of the Louvre. The building was

* Asiatic Journal.

not then finished, and contained many birds of prey, which, not being molested in a city where it was not permitted to shoot them, were quite tame. My window looking into the square court of the Louvre, I had many opportunities of seeing the birds. At the time when the young were beginning to fly, I have often seen the old birds coming with a dead mouse or sparrow in their talons, hovering over the court, and calling to the young birds which remained in the nest. The latter came forth on hearing their parents, and fluttered under them in the court. The old birds then rose perpendicularly, apprizing their scholars of the circumstance by a loud cry, and let fall the prey, on which the young birds precipitated themselves. At the first lessons, with whatever care the old birds dropped the mouse or sparrow, so as to fall near the young ones, it was seldom that the latter caught the object; and, when they failed, the old birds came down like a ball, and carried it off before it had reached the ground. They then ascended to repeat the lesson, and never allowed their pupils to eat the prey until they had caught it in the air. When the young birds had become perfect at this exercise, the old ones brought them living birds, and repeated the above manœuvre until the former were able to catch them, and had consequently learned to provide for themselves.*

THE PRODUCTIVENESS OF PLANTS AND ANIMALS.

THE great end of fructification is to produce the seed, and thus to perpetuate the species. The care taken by nature to effect this, and also to disseminate the seeds when ripened, calls for our highest admiration. There is, however, another object in view than the continuation of the species merely, for multitudes of animals are to be fed and supported by them. To this source man himself is indebted for bread, "the staff of life," and many races of animals subsist entirely on vegetable seeds; and hence, plants in general produce a much greater number of these than is necessary for their own continuance. The same observation will equally apply to animals; and it may not be uninstructive to glance at the comparative fertility of the two. In so doing, we need not advert to the multitudes of insects and microscopic beings which inhabit almost every department of nature; a few observations on *fishes,* which, perhaps, more than any other animals, carry on a constant state of mutual depredation, will be sufficient. Their roe, or spawn, is left to take its chance amongst thousands of enemies: and were not the *ovula*, or seeds composing it, extremely numerous, not only would the respective species be much thinned, but many others would be deprived of a principal source of nutriment. It might seem like exaggeration to assert that a *smelt,* only two ounces in weight,

* Le Globe.

should have in its roe 38,278 eggs, or that 4,096,000 have been computed in the pea of a single *crab;* yet nothing is more true. In the middling sized *cod-fish*, Leuwenhoeck found 9,384,000: and the following calculation is not a little curious:—"A *cod-fish* was lately sold at Workington market, Cumberland, for 1*s.*; it weighed 15 lb., and measured 2 feet 9 inches in length, and 7 inches in breadth. The roe weighed 2 lb. 10 ounces, one grain of which contained 820 seeds or eggs; the whole, therefore, might contain 3,901,440 seeds. Supposing that each of the above eggs should have arrived at the same perfection and size of the mother-fish, its produce would weigh 26,123 tons, and consequently would load 261 sail of ships, each of 100 tons burthen. If each fish were brought to market and sold for 1*s.*, this would net a clear sum of £195,000!" (Daniel's Rural Sports, vol. ii. p. 34.) Yet this comes far short of the fertility of the *sturgeon*, a single fish, of this species containing in its roe 150,000,000,000 of eggs.*

INCREASE OF THE NUMBERS OF MANKIND.

On the supposition that the human race has a power to double its numbers four times in a century, or once in each succeeding period of twenty-five years, as some philosophers have computed, and that nothing prevented the exercise of this power of increase, the descendants of Noah and his family would have now increased to the following number;—1,496,577,676,626,844,588, 240,573,268,701,473,812,127,674,924,007,424.

The surface of the earth contains, of square miles, -	196,663,355
Mercury, and all the other planets, containing about	46,790,511,000
The sun contains, - - - - - -	2,442,900,000,000
	2,489,887,174,355

Hence, upon the supposition of such a rate of increase of mankind as has been assumed, the number of human beings now living would be equal to the following number for each square mile upon the surface of the earth, the sun, and all the planets, —61,062,000,000,000,000,000,000,000,000,000,000,000; or to the following number for each square inch,—149,720,000,000,000, 000,000,000,000,000. This last number alone is infinite with relation to human conception. Merely to *count* it would require an incredible period. Supposing the whole inhabitants now upon the surface of the globe to be one thousand millions, which is believed somewhat to exceed the actual number, and supposing that this multitude, infants and adults, were to be employed in nothing else but counting,—that each were to work 365 days in the year, and 10 hours in the day, and to count 100 per minute, it would require, in order to count the number in question, 6,536,500 millions of years.†

* Drummond's First Steps to Botany. † Quart. Journ. of Agricul.

HEIGHT OF THE PERPETUAL SNOWS ON THE CORDILLERA OF PERU.

M. Pentland ascertained that the lower limit of the perpetual snows on the acclivities of the eastern Cordillera of Upper Peru, is very rare under 17,061 feet, while on the Andes of Quito, *although much nearer to the equator*, this limit is only 15,749 feet. M. Pentland, when travelling through the pass of *Altos de Toledo*, in the month of October, found that upon Inchocajo, which belongs to the Western Cordillera, the inferior limit of the snow was 1,312 feet above the pass, or 16,831 feet above the sea.

The northern back of the Himalaya has already exhibited a similar anomaly, and produced by the same cause. We allude to the influence which the great table-lands ought necessarily to exercise on the law of the decrease of heat in the atmosphere. It is evident if this law had been found for a free atmosphere, by means of aerostatic voyages, the numbers it would furnish would make known very nearly the temperature of the different zones of a mountain, if this mountain was isolated, shot up rapidly into the air, and supported itself on a base of inconsiderable extent, and at the level of the sea. The same would not be the case if the mountain rested upon an elevated table-land; at an equal height the temperature would be more considerable than in the first case. It is also through the influence of the table-land on which the two Cordilleras of Peru rest, that we are enabled to explain how organic life is preserved at so great an elevation. In the Andes of Mexico, between 18° and 19° north latitude, all vegetation ceases at a height of 14,075 feet; while in Peru, at a greater height, in the continuation of the same chain, there exists not only a numerous agricultural population, but also villages and large towns. At present one third of the population of the mountainous districts of Peru and Bolivia, live in regions situated much above that where all vegetation ceases under the same latitudes in the northern hemisphere.*

GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

The primary causes of the distribution of species, as well in the animal as the vegetable world, are, in the opinion of Humboldt, among the number of mysteries which mere natural science cannot reach. This science, or the branch of it which takes cognizance of zoological geography, is not, however, occupied in the investigation of the origin of beings, but rather of the laws according to which they are now distributed over the surface of the earth. It is the spirit of inductive philosophy applied to the ascertained facts of zoology, as connected with clime and country. It enters into an examination of things as they are, the co-existences of vegetable and animal forms in each

* Jameson's Journ.

altitude, at different heights, and at different degrees of temperature; it studies the relation under which particular organizations are more vigorously developed, multiplied, or modified: but it approaches not problems, the solution of which is impossible, since they touch the origin or first existence of the germs or life.

Many interesting facts have been ascertained and detailed by scientific observers of late years, which in a collected form, would serve as the basis of a memoir on animal geography, which, however imperfect, would scarcely be devoid of interesting and important results.*

ON COLUMBA ROOT.

Columba root has long been a well known article of the Materia Medica, and esteemed a valuable medicine for rectifying the tone of the stomach and alimentary canal, when injured by such diseases as cholera and dysentery. The plant grows in the countries of Mozambique and Querimba on the east coast of Africa. The authorities at the Portuguese settlements there have endeavoured to preserve to themselves a monopoly of the medicine, and they long succeeded in doing so. In the year 1805, however, a single plant was brought alive to Madras by M. Fortin. This specimen grew and flowered there, and was described by Dr. Andrew Berry, then of the Medical Board of Fort St. George, now of Einburgh. It proved a diœcious plant; and Dr. Berry correctly remarked, that it was closely allied to the genus Menispermum. The individual growing at Madras was a male. Wildenow and Sprengel inserted the plant in their systems under the name of Menispermum palmatum. Sir J. E. Smith, in Rees's Cyclopœdia, conjectured that it had been carried from Columbo, in Ceylon, to the East Indies, and had thus derived its name. This, however was a mistake, it being known in Africa by the name of Kalumba. De Candolle afterwards determined that the plant properly belonged to the genus Cocculus, but regretted that he had no means of describing the female flower or the seed. After the lapse of twenty years, an enterprising naval commander, who was fond of botany (Captain Owen), happened to be stationed in the Mozambique Channel, and of course had a good deal of intercourse with the natives on the coast. He succeeded in bringing away from the port of Oibo, many cases containing living plants of both sexes. Some of these were taken to Bombay, others to the Isle of France, and some to the Seychelles Islands. All the plants left at the Mauritius proved male; but females appeared among those at the Seychelles, and from thence some female plants were transmitted to the King's garden at the Isle of France: so that the multiplication of the plant by seed is now certain. Pro-

* Edinburgh New Philos. Journ.

fessor Bojer of the Mauritius has sent home drawings and descriptions of both sexes; and Professor Hooker of Glasgow has just published these in the Botanical Magazine, of which he is the able conductor. A tincture had been made from the roots of plants grown at the Mauritius, according to the formula of the London College: it was found to be stronger, and to have a more grateful and aromatic flavour, than that procured from Apothecaries' Hall. We are happy to add, that living plants have been sent to this country by Mr. Telfair of the Isle of France, and have been received both by Mr. Barclay of Buryhill and by the Glasgow Botanic Garden.*

NATURE OF RESPIRATION.

My idea is, that the common air inspired enters into the venous blood entire, in a state of dissolution, carrying with it its subtile and ethereal part, which in ordinary cases of chemical change is given off; that it expels from the blood carbonic acid gas and azote; and that, in the course of the circulation, its ethereal part and its ponderable part undergo changes which belong to laws that cannot be considered as chemical,—the ethereal part probably producing animal heat and other effects, and the ponderable part contributing to form carbonic acid and other products. The arterial blood is necessary to all the functions of life, and it is no less connected with the irritability of the muscles and the sensibility of the nerves, than with the performance of all the Secretions.†

LARVA OF SUPPOSED ŒSTRUS HOMINIS, OR GAD-FLY.

Which deposits its Eggs in the Bodies of the Human Species by Dr. Hill of Greenock.

An accurate knowledge of the natural history of the genus Œstrus (gad-fly or *breeze*), is of great importance in an economical point of view, when we consider that the most valuable of our domestic animals, the horse, ox, and sheep, form the usual nidus for their developement and increase, and are frequently incommoded, sometimes essentially injured, or even destroyed, by their attacks. The insect called *botts* by farriers, is the larva of the *Œstrus Equi*, and although Mr. Bracy Clark (to whom we owe the best account of that and other species of the genus‡), concludes that, upon the whole, they are not injurious to the horse, it appears, from the accounts of Valisnieri, that the epidemic which proved so fatal to the horses of the Mantuan and Veronese territories during the year 1713, was primarily occasioned by these larvæ. The disease called *staggers* in sheep is likewise occasioned by an insect of this genus (*Œstrus ovis*),

* Jameson's Journ. † Sir H. Davy.
‡ 3rd. Vol. *Linn. Trans.*

and the hides of cattle are perforated by another kind, which lives beneath the skin. The reindeer of the Laplanders, which has been said to unite in one animal the useful qualities of many, is more than almost any other a martyr to a species of gad-fly, probably peculiar to itself, and therefore named by naturalists *Œstrus Tarandi*.

That man himself, the "Lord of the Creation," should be the subject of similar attacks, is not so generally known. Humboldt, however, mentions, that he examined several South American Indians, whose abdomens were covered with small tumours, produced by what he inferred (for no very positive information seems to have been acquired on the subject) to have been the larvæ of some species of Œstrus. Larvæ of analogous forms have also been detected in the frontal and maxillary sinuses of Europeans; and the surgical and physiological journals of our own and other countries, have reported extraordinary instances of flies, beetles, &c. working out their way from different parts of the human frame.

In the 12th edition of the *Systema Naturæ* there is no mention of this insect. Gmelin, however, says, that it dwells beneath the skin of the abdomen *six months*, penetrating deeper if it be disturbed, and becoming so dangerous as sometimes to occasion death. In Dr. Turton's *General System of Nature*, there is the following notice of this insect, or of one of which the habits are similar. "*Œstrus hominis*. Body entirely brown. Inhabits South America, *Linné, ap. Pall, Nord. Beytr.* p. 157 Deposits its eggs under the skin, on the bellies of the natives: the larva, if it be disturbed, penetrates deeper, and produces an ulcer which frequently becomes fatal."

We are acquainted with the larva alone. Its description is as follows:

Length, in its present shrivelled condition, seven-tenths of an inch; circumference round the centre or thickest part one inch; colour pale dingy apple-green, tinged with brown. The mouth appears to have been somewhat tubular, but is furnished on its upper part with a pair of sharp minute hooked crotchets, of a shining black colour, probably for the purpose of adhering more firmly to the spot from which it was desirous to draw its food. The eyes are large and prominent; their colour brown. The body is composed of nine rings or segments, exclusive of the head and anal portion. There are thus, in all, eleven segments, besides the mouth, the exact number of which the larvæ of the European species consist. There are no feet. These organs are, however, obviously supplied by transverse circles of small black spines or hooks, with which the principal segments of the body are furnished; and, besides these, there are several rounded unequal protuberances on the

back and sides. The latter are possibly produced or rendered more apparent, by the decrease of size which has taken place. Supposing these minute spinous hooks to be, along with the skin, under the control of muscular action, (and Lyonnet has beautifully exhibited the complicated muscular structure of another larva), then, according to the direction in which the hooks are pointed, a wriggling motion would produce either outward or inward progression, and serve all the purposes of locomotive organs, just as (to use a familiar illustration) an ear of barley placed within the sleeve of a pedestrian, works its way in a direction opposite to that towards which its *beard* is directed.

M. GERARD'S JOURNEY IN THE HIMALA RANGE.

A MEETING of the Physical Committee of the Asiatic Society of Calcutta was held on the 27th of January 1830, Sir E. Ryan in the chair; when a letter was read from M. J. G. Gerard to Captain Archer, dated Monastery of Ranum, 15th November 1829, describing his excursion to the mountains in the vicinity of Ladag. The trip was one of disappointment and distress, along a most dreary route, but interesting from the grandeur of its desolation. He lost several of his people from the severity of the climate; and considering that he was himself affected by indisposition, he was fortunate in having escaped. The first disaster in his camp was in crossing the Paralassa, at the height of 16,500 feet. A poor man perished at noon-day with his load on his back, and the sun shining fiercely on the surrounding snow. The next accident happened in the passage of the range that bounds the Spectee Valley on the east, it being no common trial for the stoutest of the party. They had slept, at 16,700 feet elevation, in the bed of a stream, and began the ascent under a temperature as low as 17 deg., without a glimpse of the sun to warm them. The coolee could not overcome the pressure of the fatigue, cold and sickness, and he perished on the snow. M. Gerard's mussalchee also perished; he was speaking, and even laughing, a few minutes before he became a corpse, and breathed his last like a person going asleep.—M. Gerard's failure in reaching Leh principally arose from the jealousy of the government, which stopped him on the threshold of the inhabited country; where the wuzeer had, in anticipation of his arrival, crossed the intervening ridge. Our traveller found him at an elevation of 16,000 feet, surrounded by Tartars in black tents, horses, and dogs; while upon the elevated acclivities of the neighbouring mountains were herds of yaks and shawl goats, all in the luxuriance of life, in a region which theorists had placed far within the domains of eternal snow. The wuzeer and himself were soon upon friendly terms with each other, drank tea, ate beef, and smoked. His official errand had not apparently warped his private feelings; yet, though he evinced neither jealousy

nor rigour, he seemed impatient to get the traveller fairly out of his sight. He accepted of many things presented to him, and was very anxious to have a musical snuff-box, a toy which Mr. Gerard unfortunately had not provided himself with, not conceiving that such an article could have been even heard of, much less valued, in these wilds. During the nights the cold was intense, the thermometer, the day previous to the meeting with the wuzeer, standing at sunrise at 13½ deg. On crossing the Lartche-Long range, the next after Paralassa, M. Gerard found some shells at a positive height beyond 16,500 feet. The table-land of Rodpshoo offered few objects of scientific research, except its physical configuration and stupendous altitude; the only inhabitants being pastoral tribes, who live in black tents amongst the valleys, which are here upon a medium level of 16,000 feet. The whole aspect of the country was mountainous, and no expanse of level was visible, except that of the lakes, the soil undulating in heaps as far as he could see, till bounded by a snowy chain, which, he concluded, defines the declension of the streams towards the Indus. On the 20th September he lost his way upon the shore of a salt lake, and passed the night in a sheep fold, without any sort of shelter or food. "Next morning (he writes) we were covered with snow, from which we were afraid to extricate ourselves till the sun began to melt it. The camp was discovered in a gorge, at an elevation of 16,000 feet; and here I found my situation most alarming, being confined to my bed, and all around white with snow, and our rear and front intersected by enormous mountains, the lowest level being Lake Chumorerell, which is still upwards of 15,000 feet. This is a beautiful sheet of water, our route lying along its margin for a day's march of nine hours. Another lake was covered with wild-fowl, screaming like sea-gulls announcing a storm. Their borders were speckled by the black tents of Tartar shepherds, who migrate from pasture to pasture with their flocks:—what they do in winter I cannot conceive. During the day we had to contend with scorching sunshine, and at night with a temperature varying from 16 to 18 deg., once 13 deg. in the tent, at an elevation of 17,000 feet. Herds of wild horses were frequently close to us, but they would not allow us to approach sufficiently near to fire at them with any effect. They are a singular species, between the mule and the ass; and in colour, being spotted, they resemble the deer,—as also in their habits, for they gallop off to the cliffs with as much agility. I am inclined to think them a kind of zebra. The limit of the snow was very lofty in some places, not under 20,000 feet; yet, on my north-east, there appeared, at intervals, white tops of the most transcendent grandeur and altitude, indicative of scenes where the mind wanders with emotion, the more heightened from the undefined nature of the objects. My nearest approach to the Indus was only three days' journey; and I shall always regret the circum-

stance of my situation, which deprived me of the gratification of beholding that desolate, and almost unapproachable, river; but I durst not attempt to deviate from the high roads: the yaks which carried my camp being hired, and our provisions for twelve days already failing us, which obliged me to sacrifice several pretty shawl "goats for food to my people." At one spot, under the Chinese government, M. Gerard was closely watched, and kept in restraint, which was the more irksome as the soil was covered with fossils. At another spot, but under Ladak, he was more fortunate, and pursued his objects undisturbed. He managed, during the trip, to make a splendid collection of shells and shell-rock, gathered at elevations between 15,000 and 16,000 feet. His route down the Valley of Spectee was far from uninteresting. He visited several monasteries, and entertainments of lamas, partaking of their greasy tea and beer. The situation of the monastery of Ranum, whence his letter is dated, he describes as delicious, after the bleak and gelid regions of Ladak, with grapes, apples, and other fruits, all round; a glowing temperature during the day, but chill nights. M. Cromo de Koros, he states, was just above him, and they met daily. His works, M. Gerard adds, are of the first character, and full of interest.*

OBSERVATIONS ON THE SOUTH WELSH COAL BASIN.

By Mr. Francis Forster.

This coal field, or basin, affords not only numerous beds of common bituminous coal, but also beds of glance-coal, or anthracite; and the quantity of ironstone it contains is so vast, that nearly one-third of the immense supply of British iron is raised, smelted, and manufactured within its circumference. Mr. Forster also remarks that it is the source from which the Cornish mines derive their supply of coal, and is the market to which London must look for a supply, whenever that period arrives that the coal of our northern districts either becomes so scarce, or is so difficult and expensive to procure, that it cannot compete with that of Wales. The sides of the coal basin are of mountain-limestone, which rests upon the old red sandstone. The coal formation exhibits the usual rocks and alternations. In some places the position of the strata appears changed by some action after their deposition, in others natural unaltered wavings of the strata occur. The quantity of carburetted hydrogen gas occurring in the Welsh collieries is very trifling, as compared with the Durham and Northumberland districts: this, Mr. Forster remarks, may in some degree arise from the greater inclination of the strata allowing the gas to find its way to the surface between the planes of the different beds; that it cannot be altogether at-

* Jameson's Journ.

tributed to the great inferiority of the Welsh coals, for the *artificial* production of gas is evident, from the remarkable fact, that the glance-coal (stone coal) seams generally abound more in *fire-damp*, than the seams of bituminous coal. In regard to the quantity of coal in the whole basin, Mr. Forster calculates, it is true in a rough way, that it may amount to about *sixteen thousand millions of tons.* The annual quantity of coal consumed and exported from Wales, amounts, according to our author, to 2,754,895 tons.*

DESCRIPTION AND USE OF THE BOTANIC MICROSCOPE.

(*See the Engraving.*)

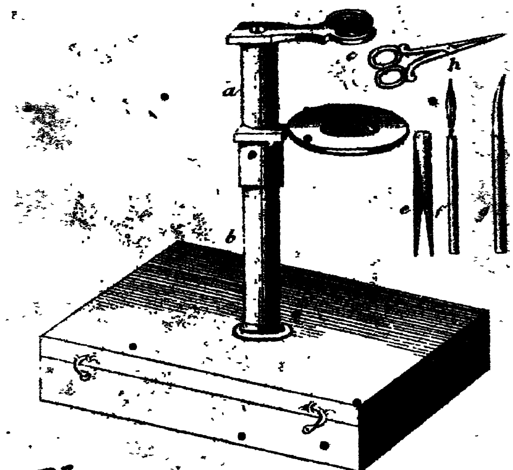
SEVERAL readers having expressed a wish that we should describe the use of a cheap microscope, we give the following as the most suitable for general purposes:

a b is a pillar, which screws into the top of the box, containing the whole of the apparatus. *s* the stage for laying the objects on; it slides up and down the pillar, to adjust the object which is to be laid upon the stage, to the focus of the magnifier *c*, three of which belong to this microscope. The knife *g*, needle *f*, and scissors *h*, are used in dissecting or separating the parts of flowers, &c.; *e* is a pair of tongs for taking up any small object, or turning it about on the stage. There is an ivory plate fitted to the stage, black on one side and white on the other; dark-coloured objects should be laid on the white side, and *vice versâ.*

To use the Microscope.—When taken out of the box, slip on the stage; and having screwed the pillar into the top of the box, it is ready for use. Lay the object on the stage, and slide it up and down till it appears perfectly distinct: as most persons' eyes differ, every one should adjust the object to his own. The three magnifiers are of different foci, and may be used separately, or either two of them together, or all three, by screwing them one on the other, making, in this way, seven different powers. The smallest magnifier has the largest aperture. When more than one is used, the least magnifier, or that with the largest aperture, should be next the object. Let as much light as possible fall on the object while under examination, particularly when the greater magnifying powers are used; and be attentive not to shade it with the hat, or other part of the dress. If this precaution is not attended to, the objects will appear obscure; this will also be the case if the magnifiers are not quite clean. Wash-leather is the best thing to wipe the glasses with, and a piece is put into the box for that purpose. This microscope is not confined to the examination of botanical subjects, but may be used for any kind of objects that can be laid on the stage, such as specimens of minerals, seeds, shells, insects, &c.; and, as a contrast to these, artificial objects, as medals, coins, intaglios, cameos, fine writing, printing, miniature-painting, and engraving; silks, fine lace, linen, watch-work; in short, any of the finest works of art. Price 12*s*.

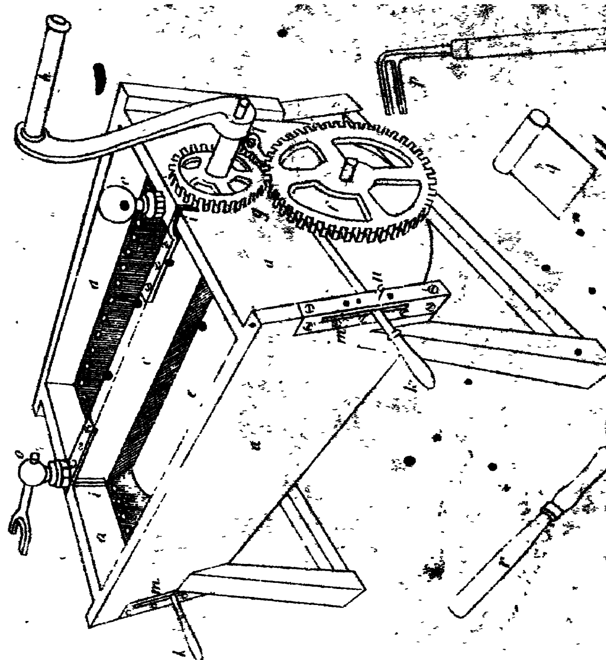
There are a variety of other microscopes, at various prices, up to 7 and even 10 guineas, and we have seen one in the workshop of a celebrated manufacturer at Munich, the price of which was 150 guineas. There are

* Trans. Nat. Hist. Soc. Northumberland.



Botanic Microscope.

See Pag.



Patent Dough-kneading M

also various magnifying glasses in use by naturalists, and especially by mineralogists, at various prices, from 1*s*. 6*d*. upwards. A good plan for an intending purchaser is to state his wants to a respectable tradesman, and be guided in a great measure by his advice.*

ERUPTIONS OF WATER.

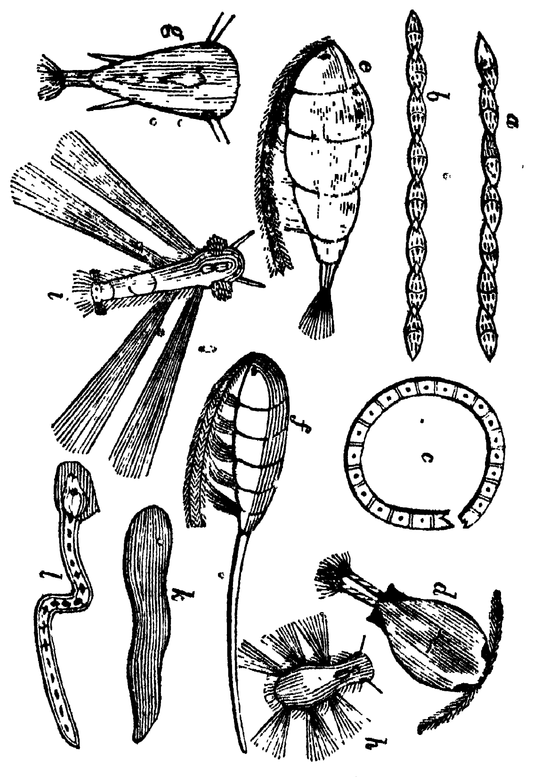
During volcanic action, torrents of water sometimes flow from the craters, and sometimes from fissures on the sides of the mountains. During the last eruption of Mount Idienne, a volcano in the east of the Island of Java, it vomited forth so great a body of water, that it inundated the country, extending from the mountain to the sea, for an extent of twenty leagues, and gave rise to two large rivers. The water was hot, and charged with sulphuric acid, and destroyed the whole vegetation of the country over which it passed. The river Pusanibio, also named Rio Vinagre, in Columbia, rushes from the foot of Puraci, an extinct volcano 2,650 yards above the level of the sea. Its waters are charged with oxide of iron, sulphuric acid, and muriatic acid. Near to Beaune Cote d'Or, in France, there is a spring named Genet, which, during different periods of the year, throws out torrents of water, that inundate the country for several days. In the departments of Doubs and Haut Soane there are many springs of the same description. The most remarkable is that named Frais-Puits, at some distance from Vesoul. This fountain vomits forth, in intervals of two, three, four, and five years, sometimes after rains, sometimes without rains, water, in so great a quantity, as to inundate the whole valley, the Prairie of Vesoul, and even the lower part of the city. This aqueous eruption sometimes continues for three days, after which the torrent ceases to flow. The opening resembles a true crater, and the water, in rushing from it, is accompanied with a loud noise. Similar phenomena are presented by the Fontaine-Ronde, near to Pontarlier, the pits of Breme, to the north of the town of Dormans, and the spring situated near the bridge of Cleron.†

LUMINOUSNESS OF THE SEA.

An exceedingly interesting paper upon this phenomenon will be found in the *Magazine of Natural History* (*No.* 14, *July* 1830,) it was originally read before the Plinian Society, by W. Baird, Esq., an ingenious member. The contribution occupies nearly a sheet, or 16 pages, of the Magazine, and is abundantly illustrated with wood engravings. Some of them, the writer thinks, represent new species of the animals which produce this ocean-light: we can, however, only quote one of his engravings, and its accompanying explanations.

* Mag. Nat. Hist. † Jameson's Journ.

In addition to these animals, all of which may be perhaps referred to the Medùsa and Actínia tribe, there occurred two other bodies of a different figure and construction, and apparently animals. The first of these (see the cut *a*) occurred in considerable quantity, especially in the



Straits of Malacca and in the Java Sea; and though I cannot say I observed these bodies distinctly luminous, they seldom occurred except at such times as when the sea was vividly so. They are composed of a series of short, oval, hollow tubes, quite transparent, finely jointed to each other by a narrow neck, and so exceedingly brittle that it was impossible to obtain any thing but fragments for examination. About the centre of each tube or division there appeared a dent or depression, marked by a dark line, and in this hollow lay a small round body like an ovum. Nearer the extremities, also, were to be seen a number of small round bodies, shaped like nails and pretty regularly disposed. In some, as in *a*, the tubes or joints seemed almost detached from each other, except where they were united by a small point. In others, as in *b*, they seemed to enter each other by a sharp point at the extremity: this differ-

ence most probably arising from the position of the objects while under examination. The natural size of each joint appeared to be not larger than a grain of sand. The other body, *c*, only occurred once to me, and it appeared also to be a fragment. It was coiled round in a circular manner like a snake, not forming a perfect circle, as the extremities, which were both open, did not meet. Through its whole length it was separated into a great many divisions or short tubes, each band of division or septum being double, and each division containing a dark spot in its centre like an ovum. Natural size about the sixth of an inch in circumference.

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veral of these I have already mentioned, as two or three species of *Cáncer*, &c.; but there are also a good many of the Crustàcea, belonging to the order Entomóstraca of Muller, which possess this property.

One of these Entomóstraca, which occurred several times and in considerable abundance when the sea was most luminous, is figured in *d*. The head and body are in one, flat, of an oval shape; tail double, each portion terminated by a fasciculus of fine hairs; antennæ two, linear, armed with hairs or bristles on both sides, which point forwards; eyes two, situated laterally, and near the upper part of the body. Near the lower extremity of the body, close to the tail, were two dark substances projecting outwards, most probably the ovaries The body of the animal was quite transparent, and showed the viscera and the red blood in motion; natural size a grain of sand. This little animal bears a considerable resemblance to one of Muller's figures, a species of Cyclops; but as that genus is characterized as having only one eye, and as I made out distinctly two in this specimen, I cannot, till another opportunity occurs of farther examination, refer it to that genus. Two other little creatures, however, occurred, which I have no hesitation in referring to the Cyclops of Muller. (*e* and *f*.) One or two species have been ascertained, by Sir C. Giesecké in Greenland, to be luminous, and Dr. Macculloch has added thirty-three new species in our own seas, all of them highly luminous. The first of these which I have represented, *e*, is an exceedingly nimble little creature; and, not being larger than a pin's point, it required great attention to be able to follow its movements. The body is of an oval shape, divided into five segments; antennæ two, linear, covered with prickles or hairs, and fully the length of the body; feet about five on each side; tail double, each division terminated by a number of fine hairs; eye, one; the round spots on the upper surface of the body are ova. This species somewhat resembles the *C. rùbens* of Muller (Entomostraca, tab. xvi. fig. 3.); it is, however, a very distinct species. *f* is also a Cyclops, possessing great rapidity of motion, and almost eluding observation as it darts through the water; body oblong, divided into six segments; tail consisting of two long fine hairs or setæ, fully the length of the body of the animal; eye, one; antennæ two, linear, beset with setæ; feet about five on each side; a very distinct species from the last, and very different from any of Muller's. *e* is the more common of the two, occurring in the Atlantic, Straits of Malacca, &c.; *f* I only observed in the Straits of Malacca. *g* belongs to a different genus altogether; head and body in one; very obtuse at the upper extremity, and gradually tapering towards the tail, which consists of two divisions, each terminated by a cluster of fine setæ; eyes two, lateral and inferior.

From under these, on each side, are projected two short antennæ. I could only see this animal in a prone situation, and on that account could only see two legs near his lower extremity. The colour of this curious little creature was of a beautiful silvery hue, with a pearly lustre: the body was transparent, and his viscera and red blood could be distinctly seen in constant motion. Natural size, a grain of sand; found in the Straits of Malacca. *h* is an exceedingly minute animal, but not possessing such celerity of motion as several of the last mentioned; head rather large and obtuse; body oval, connected to the head by a narrower portion, or neck; eyes, two; antennæ four, the inferior of the two shorter than the upper ones; no tail; lower extremity of the body emarginate; body hairy; natatory feet collected into three clusters on each side, nearly half the length of the body. This animal was quite transparent, and in the upper part of the body the mouth could be distinctly seen, of an oval shape, opening and shutting at the will of the animal. Habitat, Straits of Malacca.

These little animals are extremely interesting in many respects; but there was one which I observed still more so than any other yet described, not from his motions, which were surpassed in quickness by the Cyclops, nor from his colour, which was far exceeded by *g*, but from his animal economy and the curious provisions with which he is endowed for catching his food. This extremely interesting little animal is represented in *i*, and appears to belong to the same genus as the last. Body oblong, divided into five segments, the upper one the largest, the lower one oval and smaller than the rest; head large and obtuse; eyes, two; antennæ four, two on each side, one much shorter than the other; natatory feet consisting of four clusters, two on each side, as long as the body of the animal, which was covered at the sides with long hairs. On each side, about the middle of the head, and also on each side of the last segment of the body, or what, perhaps, may be termed the tail, there is attached a circular fasciculus of fine short hairs; the body being quite transparent, the mouth and viscera could be plainly seen. Its motion was rather slow, the long hairs composing its natatory feet were gently put in motion, so as slowly and gracefully to carry him a short distance through the water; he would then stop, and immediately set the circular fasciculi of short hairs already mentioned, at his upper and lower extremities, in motion, which was so exceedingly rapid as at first to escape detection. This very quick circular motion produced a regular whirlpool in the water around him, which extended in a very short time to a considerable distance, the mouth of the animal forming the centre of the vortex. The objects all round about were thus put in motion, and sucked into the part where his mouth is situate, which at such times was constantly and rapidly contracting and dilating, swallowing some objects and rejecting others, the viscera at the same time having evidently a strong vermicular motion. It appeared to be very rapacious, as the whole time it was under the microscope it seemed to be almost constantly in search of food. Found in the Straits of Malacca.

I have still two other animals to describe, belonging, however, to different classes from the last mentioned. The one (*k*) is evidently a Planària, in its motion very much resembling the leech: natural size, a grain of sand; colour white; found in the Straits of Malacca. The other (*l*) belongs to a genus unknown to me. It is exceedingly nimble in its motions; the head, which is rather large and unshapely, was enveloped in a membraneous bag, which seemed also extended over the

whole body. It was quite transparent, the body spotted with bars of a dark colour. Found in the South Atlantic Ocean.

In drawing up this paper for the Society, I have not gone to any length to endeavour to *prove* that the luminousness of the sea is caused solely by the presence of animalcules, and this, for the following reason, viz., that there scarcely now exists a doubt upon the subject. Any arguments which I could have produced may be found much better expressed and more forcibly illustrated by referring to Dr. Macculloch and Mr. Macartney.

Mr. Baird concludes with these sensible observations:—It is an opinion held by sailors, and which is to be found as having prevailed amongst that class of people from the earliest times, that the luminousness of the sea is a forerunner of stormy weather; and this opinion has even been taken up and defended by several authors, who have written upon this subject. The fact of the matter is, that very frequently these little animals seem, like many others of the animal kingdom, to be aware of the change of weather; and, instead of giving warning by their shining brighter at such times than they did before, they disappear altogether, no doubt taking refuge from the agitation of the waves by descending to a more secure situation deep in the water. And even when at times, as it no doubt occasionally does happen, the sea in bad weather is particularly luminous, it is evidently produced by large Medusæ, such as the M. pellucens of Sir J. Banks, and other large animals, and only takes place when the gale has already arrived, being nothing more than a concomitant, not the forerunner, of an agitated sea. From my own observations upon this subject, were I to say that it is at all connected with meteorological appearances, I should be disposed to believe that it is more brilliant and more generally diffused over the surface of the water, immediately before or during very light rain, not absolutely during a calm, but when there is only a gentle breeze at the time. I have frequently observed at such times the sea particularly luminous, and have also heard it remarked by seamen as a forerunner of rain. This, however, like every other prognostic, frequently fails, only showing how little all such prognostics are to be attended to.—*Park-street, Edinburgh, July* 14, 1829.

MOTIONS IN WATER CAUSED BY THE PROCESS OF RESPIRATION IN ANIMALS.*

As the function of respiration in the Unio pictorum is effected, on the one hand, by the branchiæ or gills, and, on the other, by the air contained in the water, the necessity of a constant contact of both is evident, and is shown in a way which is deserving of particular notice. If we place a living mussel in a flat vessel filled with water, we will observe, after every thing is at rest, that the mantle-slit provided with tentacula, and the anus, will project; and suck in water by the first, and by the latter, after it plays round the floating gills, again throw it out. If we strew the surface of the water with light bodies, as dust, semen lyco-

* The motions in water caused by sea animals of various descriptions were noticed at an early period by observers, but it is only of late years that they have engaged the particular attention of zoologists. Carus, in his prize essay, published a good many years ago, illustrates these motions by figures; and the same has been done by Dr. Unger.

podii, &c. we will observe this sucking in and throwing out of the water, by the continual circular motion of these floating particles. These circles vary much, according to the size and the elasticity of the vessels wherein the bodies are driven round by the currents of water, and suffer numerous bendings and alternations, all of which, however, can be referred back to the original current, as well represented in figure first of the plate accompanying Unger's memoir. It consists of a double whirl, in opposite directions, of which the diameter of each single whirl is several times that of the length of the animal, hence shows the force with which the water is thrown out or projected; even now changes of place, as the turning round of the animal, may be effected by the sudden and violent emptying of the inspired water on the application of a stimulus. The cause of this phenomenon is to be traced to the very particular formation of the parts by which the process is performed, viz. that the flowing water reaches its place of destination by one organ (the cleft in the mantle, the anterior tube of the mantle) and is thrown out by another organ (posterior mantle-tube or anus,) which does not occur in those mollusca a little higher in the scale, viz. univalve shells, as in them there is but one passage for respiration. Secondly, to the alternate pressure of the upper and inner free edge of both gills on the foot, by which we can explain the continued stream of water from the anus. This explanation agrees with that given by Carus several years ago, in which he compares the operation here noticed to the mechanism of a double bellows. A very easy and simple experiment will convince any one, not only of the uniformity, but also of the velocity with which the water is projected by the above mentioned parts. If we drop a minute portion of solution of china-ink on the surface of the water in a vessel in which we have placed a mussel, and directly over the upper half of the mantle-slit, we will observe, as the particles sink towards the bottom, and pass across the mantle-slit, they will be visibly drawn by it into the interior of the animal, and, before a minute has elapsed, will stream out again, more violently, from the anus, If we now examine the animal, the course taken by the china-ink will be distinctly seen, by means of the colouring of the parts. This subject has been taken up, in this country, by an ingenious observer, Dr. Sharpey.*

PROOF THAT THE STOMACH IS STILL THE BEST DISTINCTIVE CHARACTER OF ANIMALS FROM VEGETABLES.

It is generally believed that the greater number of infusory animals are very simple in their structure. Dr. Ehrenberg, of

* His observations are well stated by himself in the Edinburgh Medical Journal.—For further details, vide Unger uber die Teichmuschel. Wien, 1827.

Berlin, after many years' investigation, has convinced himself that all those kinds which are sufficiently large to admit of examination, viz. not smaller than the five hundredth part of a line, have a considerable range of structure. He used very simple means to secure the accuracy of his observations, and found that all the species of *Trichoda, Vorticella, Kerona, Paramæcium, Kolpoda, Trachelius, Vibrio, Enchelys, Cyclidium*, and *Monas*, in so far as they do not belong to a higher organization, possess at least a mouth and internal stomach. These animals, in place of being *Agastrica*, so named by Latreille, are, on the contrary, *Polygastrica*, because many of them possess more than fifty ventral sacs, all of which they can fill and empty at pleasure. These sacs are held by Müller and others to be infusoria swallowed by the animal. If we touch the drop of water in which they swim, with colouring matter of indigo, of lac, of carmine, or sap-green, they fill their single stomachs with it in the space of one or two minutes. This is very easily and distinctly seen in some of the most frequent of these creatures, as *Kolpoda cucullus, Cyclidium glaucoma*. Dr. Ehrenberg has also observed in some of the lowest of the infusoria, the formation of a reticular ovarium surrounding the ventral sacs. He could not discover any circulation or vessels in the *Paramæcium aurelia*, as asserted by Gruithuisen. But it is certain that the *Bacillariæ*, particularly the *Closterium lunula* of Nitzsch, and *acerosum* (*Vibrio lunula*, Müller, and *Vibrio acerosus*, Schrank), are provided with feet in the form of papillæ, at both ends of the body, by means of which their progressive motion is performed. It may also be noticed, that the part in the body of the *Brachiones* named heart, first by Corti, and afterwards by Bory St. Vincent, is not so, but is, according to Nitzsch and others, a maxillary apparatus. Dr. Ehrenberg is the first who has observed in all Brachiones in the *Megalotrocha*, Bory, and in a whole family of ciliated, not rotating *Furcularia*, 1 to 12 eyes. Lastly, Dr. Ehrenberg is of opinion, that the compound infusoria supposed to have the same structure as ascidia, have truly a mouth at their anterior, and an anus at their posterior extremity.*

THE NATIVES OF NEW GUINEA ARE CANNIBALS.

A NOTICE of the natives of New Guinea, by Mr. Marsden, was read at the Royal Asiatic Society. The notice principally has reference to the question of the existence of cannibalism among the natives of New Guinea; and the information it contains was derived by Mr. Marsden about the year 1785, through the medium of the Malayan language, from two Lascar sailors, belonging to the Northumberland East-Indiaman, who were of a party sent on shore from that ship while at anchor in the bay, on the north west coast of the island, in March 1783, for the purpose of

* Isis, Heft. 3. 1830.

procuring wood and water. This party was cut off by the natives, several of them being killed, and the rest made prisoners. The latter had their hair cut off and their hands bound: but they were afterwards allowed to move about freely in day-time, and were tolerably well used. The dead bodies of those who had been killed in the affray were eaten by the natives, but none of the prisoners were killed for that purpose: no distinction is made between such as are slain and such as die a natural death. The survivors witnessed the fate of two of their comrades, one a mate, the other a midshipman. The flesh was cut off from different parts of the body and limbs with small knives, then prepared by heating over the fire, in earthen pots, and eaten without salt or pepper.* The bodies of friends and relations are eaten, as well as those of enemies; and both are treated in the same manner. There is no deficiency of provision in the country. Sago, in particular, of which they make a kind of bread, called Toyo, is abundant. The inhabitants are very numerous. According to the ideas of the Lascars, 10,000 men would not be sufficient to subdue them; yet they have no king. The men from whom the preceding information was obtained were released, after a detention of about six months, upon the interference of the Raja of a neighbouring island.†

ERUPTIONS OF GAS.

M. Fournet observed, in the neighbourhood of Pontgibaud, in Auvergne, a great eruption of free carbonic acid, which issues through fissures in the ancient rocks. The bursting forth of the gas is attended with a pretty loud noise. The temperature of the gas is so high, as to affect materially that of the cavities and galleries of the mines in which it collects: this temperature assimilates the phenomenon to that of hot springs, and proves that the gas comes from a great depth. This gas, he further notices, has acted on the veins in a singular manner, by dissolving the minerals that yield to its influence, and leaving untouched the quartz, heavy spar, serpentine, talc, galena, &c.; even these also are sometimes in a corroded and disintegrated condition. It acts principally on the carbonates of iron and manganese: it converts them into bicarbonates, and thus renders them soluble in water.‡

PHOSPHORESCENCE OF THE SEA IN THE GULF OF ST. LAWRENCE.

Captain Bonnycastle, R. E., whilst coming up the Gulf, on the 7th of September 1826, observed this phenomenon under the following circumstances—At two o'clock A.M., the mate, whose watch it was on deck, suddenly aroused the captain in great

* The Battas in the interior of Sumatra use both at such feasts: the red, or Chili, pepper being understood.

† Edin. Philos. Journ. ‡ Ibid.

alarm, from an unusual appearance on the lee-bow. The night was star light, but suddenly the sky became overcast in the direction of the high land of Cornwallis county, and a rapid, instantaneous, and very brilliant light, resembling the Aurora Borealis, shot out of the hitherto gloomy and dark sea on the lee-bow, and was so vivid that it lighted every thing distinctly even to the mast-head. The mate, having alarmed the master, put the helm down, took in sail, and called all hands up The light now spread over the whole sea between the two shores; and the waves, which before had been tranquil, began now to be agitated. Captain Bonnycastle describes the scene, as that of a blazing sheet of awful and most brilliant light. A long and vivid line of light, superior in brightness to the parts of the sea not immediately near the vessel, showed the base of the high, frowning, and dark land abreast; the sky became lowering and intensely dark. The oldest sailors had never seen any thing of the kind to compare with it, except the captain, who said that he had observed something of the kind in the Trades. Long tortuous lines of light, in a contrary direction to the sea, showed us immense numbers of very large fish darting about as if in consternation at the scene. The sprit-sail yard and mizen-boom were lighted by the reflection, as though gas lights had been burning immediately under them; and until just before day-break, at four o'clock, the most minute objects in a watch were distinctly visible. Day broke very slowly, and the sun rose of a fiery and threatening aspect. Rain followed. Captain Bonnycastle caused a bucket of this fiery water to be drawn up; it was one mass of light when stirred by the hand, and not in sparkles, as usual, but in actual coruscations. A portion of this water kept in an open jug preserved its luminosity for seven nights. On the third night the scintillations in the sea re-appeared, and were rendered beautifully visible by throwing a line overboard and towing it along astern of the vessel. On this evening the sun went down very singularly, exhibiting in its descent a double sun; and when only a few degrees above the horizon, its spherical figure changed into that of a long cylinder, which reached the horizon. In the night the sea became nearly as luminous as before. On the fifth night, the luminous appearance nearly ceased. Captain Bonnycastle is of opinion that this phenomenon is caused, not by living marine animals, but from phosphoric matter evolved from exuviæ and secreted matter of fishes, &c.*

FERTILITY OF THE UNIO PICTORUM.

Dr. Unger, in his interesting anatomico-physiological account of this animal, published at Vienna in 1827, already mentioned, reckoned in a full grown animal 300,000 embryos and young individuals. This extraordinary abundance, which does not occur

* Trans. Lit. and Hist. Society of Quebec.

in animals lower in the scale, as in the medusæ, appears even considerable when contrasted with the fecundity of insects. This vast number is probably the production of only a single year, which will give for the whole life of the animal a produce of many millions of individuals.*

HERON SWALLOWING A RAT.

A CORRESPONDENT of the *Magazine of Natural History* states, that a fine full plumaged heron was captured near Dartford, in the winter of 1830-31. This bird was run down by a boy, and captured in Bexley marshes, in his stomach was discovered a very large-sized mature male *Mus* amphibius *Linn.* (water rat.) It had been lately swallowed, occupying, even to distension (with portions of partially digested fish,) the ventriculus of the heron. The only injury apparent to the animal was, a puncture made by the beak of the bird in the frontal part of the skull, by which life was destroyed. On referring to the only works I have in my possession on ornithology, no mention is made in any of so large a creature as the rat constituting the food of the Ardea genus. I think it appears evident (as the bird was in good condition, and other food in the stomach,) that, although the winter has been severe, yet necessity did not enforce such means to satisfy its hunger. The size of the œsophagus would also elicit a contradiction to its capability of such distension, if the proof were not positive. No evident cause of its easy capture existed, but the probable one of repletion.

ON CHANGES OF TEMPERATURE IN PLANTS.

IN a thesis sustained at the University of Tubingen, Dr. W. Neuffer has presented the results of a number of interesting researches into the changes of temperature which plants undergo. In a thesis presented by M. Halder in 1826, on the same subject, the author asserted that trees are in winter at a lower temperature than the freezing point, and even pass to the state of congelation, without injury to their life. The winter of 1827 and 1828 being very severe, the necessary observations were made at Tubingen for confirming those of M. Halder. The temperature of a poplar was observed during the whole of the year 1828, and the results of this examination differ little from those obtained in the Botanic Garden of Geneva, and published in the first volume of the Bibliotheque Britannique. The temperature of the air and that of the tree were about equal in February; that of the tree was higher in March, April, and May, and again the temperature of the air was higher during the other months of the year. At the beginning of January, the temperature of the tree was higher by 10 deg. than that of the external

* Jameson's Journ.

air, which would appear to announce a great disengagement of heat at the time when the aqueous juices of trees congeal. When it thawed, the heat of the tree was 4 deg. and even 8 deg. above that of the air. It is to the greater evaporation of trees in summer, that the author attributes the less elevated degree of their temperature. The reason of their heat being greater in spring is, that they then lose very little by evaporation, and retain the mean temperature of the earth, which at that season is a little higher than that of the air. The observations made during two successive winters have shown that the thermometer, in the interior of trees, may descend below zero, without the vegetation suffering. It even descended so low as + 5 deg. Fah., and + 1½ Fah. in some young trees. On the 26th January, 1828, the thermometer indicated + 1½ Fah.; the day after, it suddenly rose to + 34½ Fah.; the change was not so sudden in the tree, which, the second day, was still below 32 deg. Fah. Several trees were cut, and they were found frozen in concentric circles to a certain depth. The frozen wood was easily known by the greater resistance which it offered to cutting instruments. In the six trees that were cut, the wood was frozen to the following mean depths:—*Æsculus Hippocastanum*, 8.2 lines; *Pinus Abies*, 12.5 lines; *Acer Pseudo-platanus*, 15.2 lines; *Fraxinus excelsior*, 16.8 lines; *Corylus Avellana*, 16.9 lines; *Salix fragilis*, 17.3 lines. The water in a pool near these trees was frozen to the depth of 8.8 inches.

Experiments made with care prove, that the cold had penetrated into the trees partly in direct proportion to the quantity of water which their wood contained. But much more certain results were obtained by the examination of the concentric layers of different trees, and the result was, that the cold had penetrated least into the trees whose layers were closest.

In spring, the cold often causes trees to perish, without their having been injured by it in winter. On this subject, the author apprizes us that nearly all trees contain, at the beginning of April, 8 per cent. more of aqueous parts than at the end of January. Water being a better conductor of heat than dry wood, the deleterious action of cold upon trees will easily be accounted for by its great abundance. The young branches, containing a much greater quantity of water, suffer more from cold.

The results of experiments made upon a great number of plants, with the view of discovering the quantity of water which their leaves contain, are then detailed. Trees and shrubs have much less water than herbaceous plants. If the former contain from 54 to 65 parts in the hundred, the latter contain from 65 to 70, and even 88 parts. Succulent plants present from 90 to 95 per cent. The floral leaves generally contain more watery parts than the stem leaves. The quantities of water contained in the leaves of a great number of plants are presented in a table. Another table shows a certain number of vegetables, on which

observations have been made for determining the velocity with which their leaves emit their aqueous parts. The species which present the most rapid evaporation, are those which require the greatest quantity of water in vegetating. If the carices, the gramineæ, and the aquatic plants, evaporate in a short time, the large quantity of water which they contain; the succulent plants, on the contrary, give it out but very slowly, for which reason they vegetate easily in the warmest countries. The coniferæ, and shrubs with coriaceous leaves, resemble the succulent plants in respect to the slowness of their evaporation. Very interesting researches by the author have proved that the quantity of water given out by evaporation in the gramineæ, is, in a given space, in some cases, two or three times more than that evaporated by an equal surface of water. *Sedum album*, on the contrary, submitted to the same experiment, did not evaporate more than half the quantity given off by water.

In three tables, there are given inquiries respecting the thickness of the concentric layers, in 24 species of trees of the forests of Esslingen, where M. Neuffer examined them; the weight of newly cut wood, compared with that of wood carefully dried; and the specific weight of each kind of wood. The treatise concludes with a table, indicating the degree of cold which a considerable number of plants can support in our climates. Professor Schubler has made most of these experiments, and has compared them with those made in different botanic gardens. This treatise has afforded us the greatest pleasure, and we think it deserving of the attention, not only of physiological botanists, but also of agriculturists.*

INDIAN BIRDS.

Mr. John Gould, A.L.S., has recently received from India a large collection of birds, of which he intends shortly to publish coloured illustrations. Among these are several species, apparently undescribed, from the Himalayan mountains. The forms of a large proportion of these birds are capable of being identified with those of Northern Europe, at the same time that many of the forms peculiar to Southern Asia and the Indian Archipelago, are found intermingled with those of the northern regions. Among the forms similar to the European are three species of *Jays*, which have been named *Garrulus Lanceolatus*, *Garr. Bispeculatus*, and *Garr. Striatus*. The two first of these exhibit a striking affinity to our well known English bird. The latter species deviates in general colour and markings from the European species. Although according in form, and in the former characters, they exhibit a manifest approach to the *Nutcrackers*, or genus *Nucifraga* of Buffon. A new species of this latter form, *Nucifraga Hemispila*, is also amongst this collection, thus adding a second species to a group hitherto supposed to be limited to one. The collection

* Jameson's Journ.

also contains two species of *Woodpecker,* which have been called *Picus Occipitalis* and *P. Squamatus,* and approach in size and colouring most closely to the European *Green Woodpecker.* There is also a species of *Hawfinch* (*Coccothraustes Icteroïdes,*) according accurately with the characters of the northern species; and also a small owl (*Noctua Cuculoides,*) nearly allied to the *Noctuæ Passerina* and *Tengmalini* of Europe.

Among the forms in this collection, which are peculiar to India, is a second species of the singular group, which contains the *Horned Pheasant,* or the *Meleagris Satyra* of Linnæus, and which has lately been separated by M. Cuvier, under the name *Tragopan:* it has been named *Tragopan Hastingsii.* There is also a species of true *Pheasant* (*Phasianus albo Cristatus,*) which seems to have been indicated by former writers from incomplete descriptions or drawings, but never to have been accurately characterized. A third species is likewise added from the collection to the group of *Enicurus* of M. Temminck, which has hitherto been considered limited in range to the Indian Archipelago (*Enicurus Maculatus.*)

The same collection also contains several species of humming birds; one of which, previously undescribed, has been called *Trochilus Loddigesii;* it approaches most nearly to the *Tro. Lalandii,* Vieill.*

HUMBOLDT'S ACCOUNT OF THE GOLD AND PLATINA DISTRICT OF RUSSIA.

The following account is part of a letter from M. Humboldt to M. Arago:—"We spent a month in visiting the gold mines of Borisovsk, the malachite mines of Goumeselevski and of Tagilsk, and the washings of gold and platinum. We were astonished at the *petitas* (waterworn masses) of gold, from 2 to 3lbs., and even from 18 to 20lbs., found a few inches below the turf, where they had lain unknown for ages. The position and probable origin of these alluvia, mixed generally with fragments of greenstone, chlorite slate, and serpentine, was one of the principal objects of this journey. The gold annually procured from the washings amounts to 6,000 kil. The discoveries beyond 59 deg. and 60 deg. latitude become very important. We possess the teeth of fossil elephants enveloped in these alluvia of auriferous sand. Their formation, consequent on local irruptions and on levellings, is, perhaps, even posterior to the destruction of the large animals. The amber and the lignites, which we discovered on the eastern side of the Ural, are decidedly more ancient. With the auriferous sand are found grains of cinnabar, native copper, ceylanites, garnets, little white zircons as brilliant as diamonds, anatase, alvite, &c. It is very remarkable, that in the middle and northern parts of the Ural, the platinum is found in abundance only on the

* Trans. Zool. Soc. Lond.

western European side. The rich gold-washings of the Demidov family, Nijnei-tagilsk, are on the Asiatic side, on the two acclivities of the Bartiraya, where the alluvium of Vilkni alone has already produced more than 2,800lbs. of gold.

"The platinum is found about a league to the east of the line of the separation of waters (which must not be confounded with the axis of the high summits,) on the European side, near the course of the Oulka, at Sukoi Visnin, and at Martian. M. Schvetsov, who had the good fortune to study under Berthier, and whose learning and activity have been most useful during our travels in the Ural, discovered chromate of iron, containing grains of platinum, which an able chemist at Catherineburgh, M. Helm, has analyzed. The washings of platinum at Nijnei-Tagilsk are so rich, that 100 *puds* (about 400 lbs. Russian) of sand afford 30 (sometimes 50) *solotniks* of platinum, whilst the rich alluvia of gold at Vilkni, and other gold washings on the Asiatic side, do not give more than 1½ to 2 solotniks in 100 puds of sand. In South America, a very low chain of the Cordilleras, that of Cali, also separates the auriferous and non-platiniferous sands of the eastern declivity (Popayan,) from the sands of the isthmus of the Raspadura of Choco, which are very rich in platinum as well as gold. M. Bousingault may, perhaps, already have thrown a new light on this American formation, and his observations will derive some additional interest from those which we have made in this place. We possess pepitas of platinum, of many inches in length, in which M. Rose has discovered beautiful groups of crystals of the metal.

"As to the greenstone porphyry of Laya, in which M. Engelhardt has observed little grains of platinum, we have examined it on the spot with much care, but the only metallic grains which we have been able to detect in the rocks of Laya, and in the greenstone of Mount Belayr-Gora, have appeared to M. Rose to be sulphuret of iron; this phenomenon will be a subject for new research. The work of M. Engelhardt on the Ural seemed to us to be worthy of much praise. Osmium and irridium have also a particular locality, not amongst the rich platiniferous alluvia of Nijnei-Tagilsk, but near Belemboyevski and Kichtem. I insist upon the geognostical characters drawn from the metals which accompany the grains of platinum at Choco, Brazil, and in the Ural."*

NATIVE GOLD.

CASUALTIES, if attended to, might often impart important hints; and these, followed up, conduct to some valuable end. The late Mr. Ireton of Ireton Hall, in Cumberland, informed me, that, in carving a pullet which had been reared on his farm, he discovered a pallet of native gold in contact with the breast-bone: it was

* Edin. Journal Nat. and Geog. Science.

nearly half an inch square; and the probability is, that the fowl had picked it up from the bed of a rivulet which flowed through part of his estate.*

AMERICAN QUAILS.

At a late meeting of the committee of Science and Correspondence of the Zoological Society of London, Mr. Vigors, the secretary, called the attention of the committee to a gallinaceous group of America, which supplied in that continent the place of *Quails* in the Old World. Of this group, or the genus *Ortyx* of modern authors, which a few years back was known to ornithologists by two well-ascertained species only, he exhibited specimens of six species—viz., *Ort. Virginianus* and *Californicus*, which had been the earliest described, the former by Linnæus, the latter by Dr. Latham: *Ort. Capistratus*, a species lately figured, named in Sir W. Jardine's and Mr. Selby's "Illustrations of Ornithology," and *Ort. Douglasii*, *Montezumæ* and *Squamatus*, which had been described by himself in the Zoological Journal. In addition to these, he exhibited plates of three others, of which no specimens were to be obtained in London—viz., *Ort. Macrourus*, figured by Sir W. Jardine and Mr. Selby; *Ort. Sonninii*, figured by M. Temminck, in the Planches Coloriées (No. 75;) and the *Ort. Cristatus* figured in the Planches Enluminées (No. 126) of M. Buffon. To these nine described species he added two others, apparently new to science, and which he characterized under the name of *Ort. Neoxenus* and *Affinis*, stating, at the same time, his doubts whether both might not be females or young males, of the imperfectly known species of *Ort. Sonninii* or *Cristatus*. Individuals of the four above-mentioned species, viz., *Ort. Virginianus*, *Californicus*, *Neoxenus*, and *Montezumæ*, had been exhibited in a living state in the garden of the Society, where specimens of the former three were still alive, having braved the severity of the last winter without artificial warmth. The *Ort. Virginianus* has bred in this country, and even become naturalized in Suffolk.†

TO RESTORE THE ELASTICITY OF A DAMAGED FEATHER.

A feather when damaged by crumpling may be perfectly restored by the simple expedient of immersing it in hot water. The feather will thus completely recover its former elasticity, and look as well as it ever did. This fact was accidentally discovered by an amateur ornithologist of Manchester. Receiving, on one occasion, a case of South American Birds, he found that the rarest specimen it contained was spoilt, from having had its tail rumpled in the packing. Whilst lamenting over this mishap, he let the bird fall from his hands into his coffee-cup; he now

* Mag. Nat. Hist. † Proc. Zool. Soc. Lond.

deemed it completely lost, but to his agreeable surprise, he found that after he had laid it by the fire to dry, the plumage of the tail became straight and unruffled, and a valuable specimen was added to his collection.*

IRRITABILITY OF THE STAMINA OF THE BARBERRY.†

M. GOEPPERT of Breslau, has published, in the Linnæa, July 1829, a memoir on the irritability of the filament of Berberies vulgaris, in which he first gives an historical account of the observations made on the phenomenon in question by Linnæus, Covolo, Kælreuter, Smith, Schkuhr, Humboldt, Rafn, F. W. Ritter, and Nasse. Linnæus was first informed of it by a gardener of Montpelier, named Bael, of whom little else is known. M. Goeppert, after confirming most of the observations of authors, made three series of experiments, with the view of determining the influence of various poisonous and other substances upon the irritability of the stamina.

1. In the first experiments, he deposited clusters of barberry flowers in different substances; he then observed that prussic acid, and other concentrated acids, aromatic waters, alcohol, and ethers, destroy the irritability of the stamina more or less rapidly. Metallic salts produce the same effect, whereas the property is in no degree altered in flowers immersed in concentrated infusions of narcotic poisons, such as nux vomica, opium, &c. This last fact is in perfect accordance with all that M. Goeppert had previously observed as to the innocuousness of narcotics with respect to vegetation.

2. In the second series of experiments, M. Goeppert brought the substances, whose influence he wished to determine into direct contact with the stamina only. He found that pure water does not hurt the irritability of the stamina, and that the narcotic infusions already mentioned have no prejudicial effect, provided they be deprived of extractive principles. Phosphorus, dissolved in almond oil, was equally harmless. A drop of prussic acid deposited upon the flower, caused, in ten seconds, a motion of contraction in the stamina towards the pistil. Some hours after, the chemical action of the acid began to manifest itself in the plant by a more or less complete destruction of its parts. The same phenomenon is produced under the influence of alcohol, ethers, essential oils, aromatic waters, some concentrated acids, &c. None of these substances, however, stimulate the stamina with so much rapidity as prussic acid. It is hardly necessary to add, that these organs lose all irritability in this last act of contraction, and, soon after, are decomposed like the rest of the plant.

* Journ. of the Royal Institution.

† For an observation on this interesting fact in Vegetable Physiology, see Arcana of Science for 1830, p. 205.

3. Lastly, M. Goeppert exposed barberry flowers to the vapours of several volatile substances. Those of the narcotic principles had no action as infusions. The vapours of hydrocyanic acid, those of mercury in the metallic state, and those of the volatile substances mentioned in the preceding experiments, by destroying the vegetable tissue, also put a stop to the phenomena of irritability.*

WHITE BAIT.

Mr. Yarrell has made several attempts to preserve white bait alive, of which the following are the results:—

Several dozens of strong lively fish, four inches in length, were transferred with great care from the nets into large vessels (some of the vessels, to vary the experiment, being of earthenware, and others of wood and metal) filled with water taken from the Thames at the time of catching the fish. At the expiration of twenty minutes nearly the whole of them were dead, none survived longer than half an hour, and all fell to the bottom of the water. On examination, the air-bladders were found to be empty and collapsed. There was no cause of death apparent. About four dozen specimens were then placed in a coffin-shaped box, pierced with holes, which was towed slowly up the river after the fishing-boat. This attempt also failed: all the fish were dead when the vessel reached Greenwich. Mr. Yarrell was told by two white bait fishermen, that they had several times placed these fishes in the wells of their boat, but they invariably died when brought up the river. The fishermen believe a portion of sea-water to be absolutely necessary to the existence of the species, and all the circumstances attending this particular fishery appear to prove their opinion to be correct.†

CIRCULATION IN VEGETABLES.

On the 27th of September, MM. Henri Cassini and Mirbel made a report upon the vegeto-anatomical and physiological observations presented by Dr. Schultz to the Academy of Sciences. It appears that a circulation takes place in vegetables, comparable, in some respects, to that in animals. In fact, when the vessels in a portion of stem, an inch or two long and two or three lines in width, are considered, assent cannot be refused to the idea, that a vital juice exists, and that it passes several times by the same path. But there is this remarkable difference between the circulation in vegetables and in animals of a high order, that in the latter there is one point in which terminate two vascular systems very distinct from each other, one carrying the blood to the extremities of the body, the other collecting it and conducting it

* Jameson's Journ. † Trans. Zool. Soc. Lond.

to its source; whilst in vegetables we discover no special point of departure, nor any double vascular system. Vessels of the same nature form a net-work, of which the meshes are so many similar circulating apparatus communicating with each other, so that there is a common motion through them whilst the parts live together, and a motion proper to each so soon as they are separated. The discovery of M. Schultz is of the highest interest for the anatomy and physiology of vegetables; it enlightens these two branches of science, the one by the other, and it proves relations to exist between animals and vegetables, which before were not even suspected to exist.*

REMARKABLE CASE OF THE RE-UNION OF A DIVIDED PART.

In the Quebec Hospital Reports we find the following case:—A man in chopping wood cut off the first phalanx of the middle finger. For two hours after the accident he remained occupied at home. Although the divided portion of his finger then appeared to be deprived of vitality, it was determined to follow the plan of Balfour of Edinburgh, and to attempt to re-unite the parts. The tip of the finger was fixed to the stump by adhesive plaster, and in three days union had taken place in two or three parts; and the extremity of the finger which had been divided had as much sensation as any other part of the body. The dressing was continued, and in three more days the re-union was complete.†

ON THE FASCINATION OF SERPENTS.

By Dr. Hancock.

It appears to me that that property of serpents which has obtained the name of fascination, does not exclusively belong to any certain species, but that it is in some measure common to all the serpent race; and that there are a few of the more subtile and cunning ones, who know how to improve by their natural endowments, and to turn those powers to advantage in their predatory pursuits.

I am decidedly of opinion, from the observations I have been able to make, as well as from the testimony of others, that there is in reality no such property as fascination in serpents. It is not a faculty of charming or of fascinating, in the usual acceptation of the term, which enables certain serpents to take birds; but, on the contrary, their hideous form and gestures, which strikes the timid animals with impressions of horror, stupifying them with terror, and depriving them of their proper sensations, which renders them unfit for any exertion.

How, indeed, is it possible that a form so terrific and forbidding as that of the crotalus, should be possessed of a power to

* Rev. Ency. † Baltimore Adviser.—Med. Journ.

render itself agreeable or inviting. It is, on the contrary, natural to suppose that it is the terrifying, not the *charming*, principle by which serpents of the most disgusting or hideous forms are most successful in taking birds; and this we find to be actually the case, for those serpents to which has been ascribed the power of fascinating, are among the most terrific of the tribe.

The torpedo benumbs its prey with an electrical shock; but the serpent disables the more timid birds by the mere presentation of its horrible front. The one hurtful or destructive agent is communicated by the touch, or some conducting medium, as water, and acts with energy upon the muscular fibre; the other finds its way by the organ of vision, and exerts its influence upon the sensorium commune or brain, and thence paralyzing the whole nervous and muscular system. No wonder that these small birds, so feebly constituted, and the most sensible perhaps of all animals to impressions of fear, should fall insensibly into the devouring jaws of their terrific adversary.

Thus the fascinating power attributed to serpents, if properly viewed, falls entirely to the ground. It is not the timid little bird or rabbit alone which is thus overcome, but the larger animals also, and even man in some instances. An occurrence of this kind is related of a Negro, belonging to Mr. John Henley, who, in the swamp of Pomeroon, fell in with a serpent of great magnitude, as the Negroes asserted, and was so dreadfully terrified that he fainted away, and was picked up for dead by his companion. The serpent was said to be a camudi (Boa Scytale,) and might have made an easy prey of the man, but was overgorged. They rarely, however, attack man, unless much provoked.

In the Orinoko, cats are said to be a mortal enemy to the serpent tribe; that they kill the crotalus, and even the coral snake, which is considered by the Spaniards to be very poisonous, though, I believe, it is harmless; and it is said are not unfrequently killed in a conflict with the former. I was told that, on some of the Llanos, where rattlesnakes abound, cats are frequently kept for this purpose by the inhabitants.*

QUANTITY OF WATER IN THE RIVER CLYDE.

The breadth of the Clyde, at the new bridge, Glasgow, is 410 feet, and its mean depth 3½ feet. The velocity of the water at the surface is 1.23 inch, and the mean velocity of the whole water is 0.558,132 inch per second. From these data it may be inferred that the quantity of water discharged per second is 76¾ cubic feet. This amounts to 2,417,760,000 cubic feet, or 473,017,448 imperial gallons, or 1,877,053 tons. The river Clyde drains about 1-30th of Scotland, or about 1-83rd part of Great Britain. Hence, if the water discharged into the sea by the Clyde afforded

* Jameson's Journ.

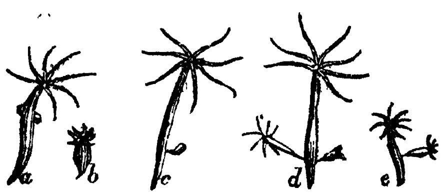
a fair average of the whole island, the total amount of the water discharged annually by all the rivers in Great Britain would be only 155,795,399 tons, which does not amount to one-hundredth part of the excess of the rain above the evaporation.*

THE HYDRA, OR FRESH-WATER POLYPUS.

By Samuel Woodward, Esq., in a Letter to the Magazine of Natural History.

I AM not aware that the subject of the Hydra, or fresh-water polypus, has been particularly noticed since the elaborate treatise published by Henry Baker, Esq., F.R.S., in 1743; and, that work having become scarce, a few remarks may be interesting to your readers.

Having, from time to time, collected these animals from the ditches intersecting the meadows in the Cathedral Precinct here, I am desirous that you should record the locality, and, at the same time direct the attention of naturalists to these interesting objects. For the purpose of ascertaining if they had resumed their summer station, I visited the spot on the 20th of May; and, in a six-ounce vial of the water (from just beneath the surface) and duckweed which I collected, I found no less than twelve animals, eight of which were of the green kind, *Hydra viridis Lin. see the cut.* (*a*, twice the natural size), and four pink-coloured (*b*), noticed by Mr. Baker, at p. 20. of his natural history of these animals. The green species were from 1 to 2 lines in length; the pink would stretch themselves to nearly 4 lines, and were much the largest animals. On the 23rd of this month they began to bud (as at *c*); and on the 24th, young animals in different stages of growth, were to be seen extending their slender arms from nearly all the specimens: in some instances one, and in others two, were seen attached to the parent stem (*d e*)." I observed, in several of the young animals, only five arms, which arose from the remaining two not being developed.



Mr. William Anderson, F.R.S., to whom Mr. Baker acknowledges himself under great obligations for his assistance in his second treatise on the microscope, paid great attention to these animals, and collected them from the ditches around Norwich; and from his manuscript journal, in my possession, it appears that the principal locality was a ditch in Spring Garden, situate about a quarter of a mile south of the place where I collected mine. He remarks that he has never found any before the beginning of May, or later than August. Of their food, he

* Thomson on Heat and Electricity.

observes that he found the small white worm, inhabiting the mud of our channels, to be more acceptable. Mr. Baker fed his upon the small red earth-worm.

THE FROG TAKING ITS FOOD.

A CORRESPONDENT of the *Magazine of Natural History* says, the friend to whom I am indebted for having first called my attention to this amusing exhibition, happened to be repotting [illegible] green-house plants, and meeting with a moderate-sized [illegible] among the roots of one of them, he carelessly threw it aside into a damp corner near the green-house. Almost immediately a frog issued from his lurking-place hard by, commenced his attack upon the worm, and soon despatched it. Another worm was thrown to him, which he treated in the same manner. But the amusing part of the business is to watch the manner in which the frog first notices his prey; and this I can compare to nothing so aptly as to what, indeed, it very much resembles, a pointer-dog setting his game; he makes, in short, a dead set at it, oftentimes, too (if the relative position of the two animals so require it), with a slight bend or inclination, more or less, of the forepart of the body to one side, just as we often see a pointer turn suddenly, when the game is on one side of him, and he has approached very near before he has perceived it. After a pause of some seconds or more the frog makes a dart at the worm, endeavouring to seize it with his mouth; in this attempt he frequently fails more than once; and generally waits for a short interval, acting the pointer, as it were, between each attack. Having succeeded at last in getting the worm into his mouth, if it be a large one, he is unable to swallow it immediately and all at once; and the portion of the worm which yet remains unswallowed, and extends out of the mouth of its destroyer, of course wreaths about, and struggles with a tortuous motion. With much, but somewhat grotesque, dexterity, the frog then employs his two fore feet, shoving and banoying the worm, first with one, and then with the other, in order to keep it as nearly as may be in the centre of his mouth, till the whole is swallowed.

THE SNAIL FORMING ITS SHELL.

If you will examine the snail of any common Hélix, you will perceive that where the body rises into the shell there is a fold or membrane of a semicircular shape. This part is denominated the *collar*, from the manner in which it surrounds the body, and it is the organ which secretes the shell. The animal is born with the rudiments of its future covering, and by its gradual increase of growth is enabled to push the collar for a space, and from time to time, beyond the original margin. In these operations. a thin layer of membraneous and calcareous matter is

excreted and deposited, which is gradually thickened by successive layers being laid on within the first by the repeated protrusions and retractions of the collar. This portion being formed, the animal commences another, and finishes it in the same manner; and the extent of each portion is marked in some shells by an elevated rib, in others by a slight depression. There is not, as the language of some authors would seem to imply, a regular and alternate deposition of a layer of membrane and a layer of lime; but in all shells the animal and earthy matters are obviously secreted and deposited at the same moment and in commixture.*

DURABILITY OF STONES.

When the felspar of the granite rocks contains little alkali, or calcareous earth, it is a very permanent stone; but when in granite, porphyry, or syenite, either the felspar contains much alkaline matter, or the mica, schorl, or hornblende, much protoxide of iron; the action of water, containing oxygen and carbonic acid, on the ferruginous elements tends to produce the disintegration of the stone. The red granite, black syenite, and red porphyry of Egypt, which are seen at Rome in obelisks, columns, and sarcophagi, are amongst the most durable compound stones; but the gray granites of Corsica and Elba are extremely liable to undergo alteration: the felspar contains much alkaline matter, and the mica and schorl much protoxide of iron. A remarkable instance of the decay of granite may be seen in the hanging tower of Pisa: whilst the marble pillars in the basement remain scarcely altered, the granite ones have lost a considerable portion of their surface, which falls off continually in scales, and exhibits everywhere stains from the formation of peroxide of iron. The kaolin or clay used in most countries for the manufacture of fine porcelain or china is generally produced from the felspar of decomposing granite, in which case the cause of decay is the dissolution and separation of the alkaline ingredients. Water is capable of dissolving in larger or smaller proportions most compound bodies: and the calcareous and alkaline elements of stones are particularly liable to this kind of operation.

When water holds in solution carbonic acid, which is always the case when it is precipitated from the atmosphere, its power of dissolving carbonate of lime is very much increased; and in the neighbourhood of great cities, where the atmosphere contains a large proportion of this principle, the solvent powers upon the marble exposed to it must be greatest. Whoever examines the marble statues in the British Museum, which have been removed from the exterior of the Parthenon, will be con-

* Corr. Mag. Nat. Hist.

vinced that they have suffered from this agency; and an effect so distinct in the pure atmosphere and temperate climate of Athens, must be on a higher scale in the vicinity of other great European cities, where the consumption of fuel produces carbonic acid in large quantities.*

NATURAL ROCKING-STONE.

Dr. S. Hibbert has communicated to *Brewster's Journal* an interesting paper on a Natural Rocking Stone of Granite, near the village of Loubeyrat, in the province of Auvergne, France. His description is as follows:

This rocking-stone, which is composed of granite, is not very considerable. Its dimensions are from two to three and a-half feet broad by twenty inches in height. It is nicely poised upon another stone of granite; but in order to prevent it from rocking after the cross had been superimposed, its steadiness has been secured by several rude blocks of stones, which are jammed into the interval round its base of support. On the top of the rocking-stone a square niche has been let in for the reception of a pedestal destined to the support of the cross. This pedestal is two feet one inch in height; its base is twenty-two inches square, from which it gradually lessens to the summit, which is only fifteen inches square. On one side of the pedestal two figures are sculptured, which from their dress appear of great antiquity. The garb is like that of certain figures which are to be found on the capitol of the more ancient part of the Church of Volvic in Auvergne, which is attributed to so early a date as the sixth century, but was certainly not later than the eighth or ninth. An inscription appears under the figures, which, from being much worn, is become unintelligible. I could only make out the word Pardon; the remaining letters probably alluded to the number of days of pardon which this cross gave to the venerator. The cross, however, which was contemporary with the pedestal, has been removed, as the one by which it has been replaced, though ancient, is evidently of later workmanship. It has been wrought from the black lava of the country, and has a height from the pedestal of about two feet.

From the tenor of the foregoing observations it is evident, that if a doubt be placed upon the legitimate authority of the antiquary to warn the geologist off his manor when he assigns the formation of the rocking-stone to the disintegrating effect of atmospheric causes, the geologist, on the other hand, has no right, though with much older pretensions of title, to include within his own pale the subject of contention, and to make it a part and parcel of his own demesnes.

Regarding, however, the particular use to which rocking-stones were applied, notwithstanding they have been the subject of infinite learned memoirs, we are still most imperfectly informed; nor is it at all probable that the obscurity will ever be removed. As they are the products of every country where loose detached rocks of a particular structure have been submitted to the operation of atmospheric agents, it is to be expected that the fables assigned to their origin would be regulated by the peculiar mythology of the people among whom they have become the object of notice and wonder.

* Sir H. Davy, in "Consolations in Travel."

ZOOLOGICAL SOCIETY.

As we have hitherto paid especial attention to the origin and progress of this Institution, the reader will probably expect a brief notice of the last anniversary.*

This meeting was held on May 3, when, in the absence of the Marquess of Lansdowne, the Duke of Somerset presided. From the report of the Auditors, it appeared that the receipts for the previous year were £16,437. 12s. arising from the subscriptions of members, admission fees of visiters to the museum, &c. The supposed value of the Society's assets was £6,000. inclusive of the farm at Kingston, which had cost about £11,000. The report of the Council stated that an arrangement had been made with the Commissioners of Woods and Forests for the ground which the Society required (in the Regent's Park), viz. 1,200 feet frontage, at a rent of £400. per annum. The expenses of the farm at Kingston were to be greatly reduced, and it was intended to breed and rear rare and new species of birds, quadrupeds, and fishes, at that establishment. It was also stated that 200,000 persons had visited the Gardens in the Regent's Park during the year, and that upwards of £3,000 had been invested in the Funds.

Among the most important proceedings of the year are, the appointment of a "Committee of Science and Correspondence," for suggesting and discussing questions and experiments in animal physiology, exchanging communications with the Corresponding Members of the Society, promoting the importation of rare and useful animals, &c. Again, in the Report of the Council, Nov. 4, 1830:—

"They have latterly been particularly anxious to place the responsibility of detail upon their salaried officers, so that their own time may be principally applied to more general superintendence, and particularly to the encouragement of scientific researches: they have, therefore, endeavoured to establish meetings of such members of the Society as have principally applied themselves to science; at which, communications upon Zoological subjects may be received and discussed, and occasional selections made for the purpose of publication. They propose from time to time to publish in the cheapest form an abstract from the most interesting of these communications; and they trust that the first of these papers will be ready for delivery on the first of January 1831.† They further propose, that these meetings shall take place on the second and fourth Tuesdays in every month; and they have invited, for the 9th of November next, such members of the Society as appeared likely, from their scientific pursuits, to take an interest in their views.

"The Council have moreover suggested that letters be sent to the superintendents of the principal Menageries in Europe, viz. at *Paris, Leyden, Munich, Vienna, Madrid,* &c., proposing mutual communication of all observations upon these matters, and an occasional interchange of such animals as may be most easily produced or imported in each country. They have also proposed, that circulars be addressed to the Cor-

* See Arcana of Science for 1828, which contains the original plan of the Zoological Gardens, and, at that time, the only connected description of the animals. The volume for 1829, and that for 1830 likewise, contain succinct accounts of the Society's progress during each year.

† These "Abstracts" have been published. See the previous pages of this volume.

responding Members of the Society, requesting particular information upon such facts of Natural History as it may be desirable to investigate at each place: and they further propose that a prize be offered for the Essay which shall contain the best and most extensive practical knowledge upon the importation and domestication of foreign animals in this and other countries."

One of the most interesting meetings was on December 2, when Mr. Vigors showed that during the gloomy month of November, 8,676 persons had visited the Gardens:—that the Society's receipts during the same period (including a balance brought forwards), was £2,025. 10s. 6d. and the expenditure £953. From another report, we learned that the whole of his Majesty's collection had been removed from the menagerie at Sand-pit Gate, Windsor, and was now in the Society's possession;—that a committee of science and correspondence, comprising eleven individuals, had been formed, by which means a friendly intercourse with the learned bodies of the continent and foreign parts might be cultivated, thereby facilitating the spread of the knowledge of comparative anatomy and animal physiology. A warm tribute of thanks was paid to Captain King and Major Franklin; to the latter, for his collection of birds from the Himalaya mountains, the Society and science in general would feel much indebted:—of these birds Mr. Vigors pleasantly observed, that they were alive on the Himalaya mountains eight months ago, they arrived in England five weeks since, and were now placed on the Society's table, accompanied by accurately coloured figures, life-size. These birds have heretofore, we believe, been strangers in England; their form and plumage are exceedingly beautiful.*

At this meeting were described the American Quails, already noticed at p. 217.

During the year the *Zoological Club* has been broken up, or we may say, has, in great part, been joined to the *Zoological Society*; and, in the early part of the present year, preliminary meetings were held for the formation of a *Zoological Institution*, with Gardens and Museum, in the county of Surrey. These facts indicate Zoology to be one of the most successful branches of science and popular study in this country.

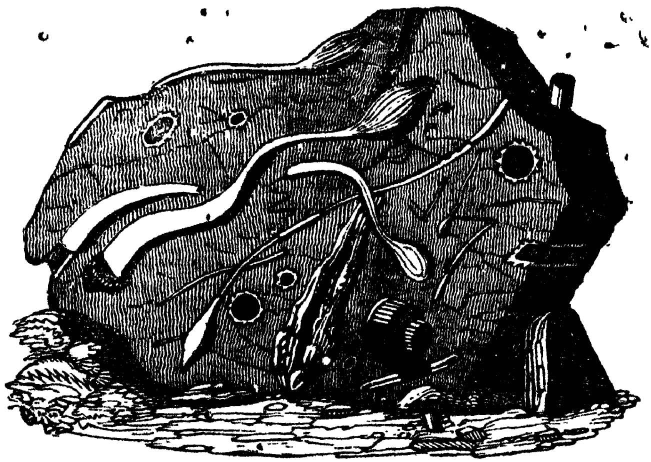
GEOLOGY.

FOSSIL ORGANIC REMAINS.

Ichthyosaurus.—On April 16, a paper entitled "Description of a New Species of Ichthyosaurus," by Daniel Sharpe, Esq., F.G.S., was read before the *Geological Society*. This specimen of Ichthyosaurus was found in a quarry of lias limestone about four miles from Stratford-upon-Avon. The whole length of the animal must probably have been about seven feet; the parts of it which remain exhibit the upper portion of the head from the nostrils backwards, in a very crushed state, a continuous series of 52 vertebræ, from the atlas to the commencement of the tail, with nearly all the spinous processes; one scapula, and nearly the whole of one fore paddle. The teeth (by which the four species formerly described have been chiefly distinguished) are entirely wanting in

* Lit. Gazette.

this individual; the author, however, considers it to be a new species, from the following peculiarities of character. 1. The length of each vertebra is uniformly three-fifths of its breadth, a proportion not found to exist in any hitherto described species. 2. The paddle is of great size, and including the humerus, must have been equal to one-fifth of the length of the whole animal. In the ulna or radius (it is difficult to say which) there is a notch on the outer edge, and all the other bones of the paddle are very nearly circular or oval; thus differing essentially from the angular shaped phalanges of I. communis, tenuirostris, and intermedius. On account of the large size of its paddle, the author names this species "Ichthyosaurus grandipes."



Sponge.—One of the most beautiful contributions to this branch of science during the past year, is a paper on "Antediluvian Zoology and Botany," by R. C. Taylor, Esq., F.G.S., in the *Magazine of Natural History*, No. xiii. This paper, though extending but to 24 pages, contains upwards of 40 block engravings, of nearly five times as many distinct specimens. We do not attempt to abridge the letter-press, but merely select one of the most striking cuts and its description, to direct the attention of the reader more immediately to this delightful branch of study. The tribe of sponges, whose structure approaches so closely to that of vegetables, is by no means abundant in the early ferruginous strata. It occurs plentifully in the ferruginous sand of Furringdon. The upper green sand contains a few species: the chalk formation abounds with them; and some spongiform varieties appear in the crag of Suffolk, but have not been properly examined. On account of the delicate texture of these bodies, and the filling up of their cellular cavities by the matter of their matrices, it is not often that they are sufficiently distinct to admit of ready examination. The recent sponges, which are classed by M. Lamouroux under seven principal divisions, comprise 161 species. *Siphoniæ* are distinguished by their resemblance to flowers (whence their

original name of Tulip Alcyonia), and consist of bundles of tubuli, derived from a pedicle, and passing through a spongious substance. Several species have been noticed by Mr. Townsend, Mr. Parkinson, and Miss Bennett. They are associated in the upper green sand, and their principal localities are the Vale of Pewsey, Warminster, the Isle of Wight, and Devonshire. Mr. Webster traced them in the limestone of Portland, and in the sandstone between the chalk and the gault on the south coast of the Isle of Wight. A beautiful series of illustrative drawings, by this writer, occurs in the *Trans. Geol. Soc.*, whence the annexed figure is derived.

Submarine Forest in Largo Bay, in the Frith of Forth.—The rocks on which this forest rest, belong to the medial order, and are accompanied by traps. The soft bed on which it is immediately incumbent, consists of brown laminated clay, which may be referred to lacustrine silt. Sands and fine gravel cover the deposit, also of fresh water origin; and over them is a bed of peat, composed of the remains of land and fresh water origin. The trees interspersed are generally birch, hazel, and alder. The nuts of the hazel were likewise observable. The clay is now burrowed by the Pholas candida, and the peat contains a Spio, named by the author *S. emarginatus.* The author connects the phenomena presented by these quarternary formations, with the supposition that the space now occupied by the German Ocean was formerly a fresh water lake.—*Brande's Journal.*

India.—At a meeting of the Asiatic Society of Calcutta, on the 5th of May last, extracts from M. Gerard's letters, relative to the fossil shells collected by him in his late tour over the snowy mountains of the Thibet frontier, were read. The loftiest altitude at which he picked up some of them, was on the crest of a pass, elevated 17,000 feet; and here also were fragments of rocks, bearing the impression of shells, which must have been detached from the contiguous peaks rising far above the elevated level. Generally, however, the rocks formed of these shells are at an altitude of 16,000 feet, and one cliff was a mile in perpendicular height above the nearest level. M. Gerard farther states, "Just before crossing the boundary of Ludak into Bussalier, I was exceedingly gratified by the discovery of a bed of fossil oysters, clinging to the rocks as if they had been alive."—*Asiatic Register.*

New Species of a Fossil Bear, Ursus Pitorii.—The bones of this bear were found, with the remains of other carnivora, in the caves of Fauzan, by Mr. Pitorre, and have belonged to a larger animal than the Ursus spelæus, in whose company Marcel de Serres thinks that it occurs in the caverns of Sundavig in Prussia. The author has not been enabled to examine the bones of the head; but the lower maxillary and the teeth furnished marked differences from the U. spelæus, and approximated to existing species. It has been found, like the U. spelæus in deposits which also contained remnants of pottery.

Fossil Animals of Russia.—Mr. Fischer proves, by his notices on the fossil animals of Russia, that in following the track of Baron Cuvier, he has studied with the greatest care that branch of knowledge which has been termed Zoognosy. According to the form of the teeth he divides the genus Elephas into five species:

1st, *Elephas mammonteus,* whose remains have been found in a great number of localities in Russia; among which he adds, to those which

Pallas has recounted, the sands which occupy the summit of the hills of Vorobieff near Moscow; the Rouza of the Moscowa, the mouth of the Lopasnia, in the Oca; and, generally speaking, the alluvium of all the rivers in the government of Moscow; in that of Vladimir, the environs of Lake Pereslavl, and the shores of the Oca, near Mourom; in that of Kalouga, the banks of the Ister, where a tusk of this animal has been found among others; in that of Toula, a great number of localities, such as the banks of the Ocetr and of the Oca, the environs of Verew and Kachira; in that of Riazan, the district of Zaraïsk, and the banks of the Pronia; in that of Orloff, the sandy banks of the Nougr; in that of Pollava, the banks of the Oudal; lastly, in that of Orel, the district of Briansk.

2nd, *Elephas panicus*, so called because the lateral furrows of the molars remind one of the flute of Pan. This precious relic, figured in the Memoirs of the Academy of St. Petersburg, was found in the government of Moscow; but was destroyed in the burning of that city.

3rd, *Elephas periboletes*, of which a tooth has been discovered on the banks of the little river of Vekcha, district of Yourief, government of Vladimir.

4th, *Elephas campylotes*, an extremely rare species, of which the University of Moscow possesses a tooth; but of which the precise locality is not known.

5th, *Elephas pygmæus*, the smallest species known, since the crown of the tooth figured by Mr. Fischer is only 4 in. 5 li. in length, 2 in. 6 li. width, and 3 in. 8 li. in height. It was found at Ratmir, on the banks of the Moscowa, and near the little river of Tcherka, in the district of Serpoukhoff.

The genus Rhinoceros has only offered to Mr. Fischer the species known under the name of *Rhinoceros tichorhinus*, and *Rhinoceros antiquitatis* or *Sibericus*. It exists in the alluvium of the Protva, in the environs of Moscow, near the mouth of the Lena, and of the Yama, and in the government of Simbirsk. One of these horns is cited, which was 32 inches in length.

The alluvium of Russia does not contain the fossil bones of any gnawing animals. Mr. Fischer cannot decidedly state if the bones of a lorus, which were brought from Tartary by Dr. Pander are really fossil.

With respect to the reptiles, Mr. Fischer is the first who mentions the existence of their remains in the soil of Russia; he gives figures of a shell and several bones, which, from the thickness of the scales, he supposes was a marine species, and which he for the present denominates *Chelonia radiata*. He is not aware of the locality of these bones; but they are imbedded in a hard clay from Siberia.

He terminates his memoir, by the description of a fish, of which he gives a figure, and which appears to be related to the Gadi, and by some words on a vertebra of three inches in diameter, which he cannot approximate to that of any known species. This fish is imbedded in a limestone, penetrated by oxide of copper, from Siberia. The vertebra is entirely siliceous, or perhaps, as he says, its impression has been replaced by a siliceous mould. It has been found in the island of Taman, in the Black Sea.

INSTRUCTIONS FOR THE COLLECTION OF GEOLOGICAL SPECIMENS

(*Copy of a paper issued by the Geological Society.*)

1. The Geological Society begs to impress upon the minds of all collectors, that the chief objects of their research should be specimens of all those rocks, marls, or clays, which contain shells, plants, or any sort of petrifaction.

2. The petrifactions should, if possible, be kept united with portions of the rock, sand, or clay, in which they are found; it being more desirable that the mass should be examined carefully when brought to England, than that any separation of the shells should be attempted at the time of their collection. This injunction, however, does not apply to those cases in which the shells fall readily from their surrounding matrix; but, in this event, great care must be taken of the petrifactions, by rolling them in paper, or some soft material.

3. If several varieties of stone are seen in the same cliff or quarry, and particularly if they contain any petrifactions, specimens of each should be taken, and numbered according to their order of succession; marking the uppermost No. 1., and thence descending with Nos. 2, 3, &c., making as correct an estimate as time will permit, of the thickness of the beds. None of these specimens need be more than 3 in. square, and one and a half or two thick.

4. If the rocks are stratified, that is, divided into beds, state whether they are horizontal, inclined, or twisted. If inclined, observe pretty nearly at what angle, and to what point of the compass they dip; if twisted, a sketch, however, slight, is desirable.—N. B. The true dip can seldom be ascertained without examining the beds on more sides than one.

5. One kind of rock is occasionally seen to cross and cut through the beds of another. In such a case, observe whether the beds are in the same plane on each side of the intruding rock; if not, mark the extent of the disturbance, and also, if there be any difference in the nature of the stone of which the beds are composed, at those points were they touch the intruding rock. Take specimens from the junction, and make a sketch of it.

6. Where there are wells, get a list of the beds sunk through in digging them; specifying the thickness of each stratum in its order, from the surface downwards.

7. In volcanic districts, procure a list of the volcanoes now or recently in action, and of those which are extinct; stating their position, their distance from the sea or any great lake; the extent, nature, and, if possible, the age, of particular streams of lava, or the relative age of different streams: also, whether the lava currents conform to the valleys, or are seen at different heights above the present rivers; and also if any gravel beds be discoverable beneath the streams of lava.

8. Note the names of all places known to contain coal, bitumen, salt, alabaster, metallic ores, or any valuable minerals, specifying their extent, and the nature of the rocks in which they occur; but do not bring away large quantities of iron ore, spar, salt, &c.

9. In cases of coal-pits, specimens of the coal itself and of the beds passed through to obtain it (especially when plants have been found) will be valuable. State whether limestone, iron ore, or springs of bitumen are found near the coal; and if the limestone contains shells, collect abundance of them.

10. Make particular inquiries whether, in digging gravel-pits, or beds of surface clay, mud, and sand, the workmen are in the habit of finding any bones of quadrupeds; and obtain as many of them as possible, selecting particularly teeth and vertebræ.

11. Search also for bones in cracks of rocks, and in caverns. In the latter, the lowest pits or hollows are most likely to contain bones; and if the solid rock be covered with a crust of spar or marl, break through it, and dig out any bones, horns, or pebbles from beneath. (*See the Cut.*)

12. Observe if the surface of the country be strewed over with large blocks of stone; remark whether these blocks are angular or rounded, and whether they are of the same or a different nature from the stratum on which they are laid. If the latter, endeavour to trace them to their native bed. Note the different heights at which gravel is found, and whether or not it is composed of the same rocks as the adjoining country.

13. Nautical collectors are requested to separate and preserve any shells or corals which may be brought up, either with the lead or the anchor; noting the depth and the locality.

14. On coasts where there is a considerable ebb tide, and where the shore consists of rocks or clay containing fossils, some of the best of these petrifactions may be looked for, by breaking up with a pick-axe the shelving beds exposed at low water.

15. In making sections, or memorandums, distinguish well upon the coast, between masses which have simply slipped and fallen away, and the real cliff itself.

16. When drift wood is met with at sea, collect pieces of it: note the longitude and latitude, the distance from the nearest land, and the direction of the current by which it has been borne. Examine well the state of the floating mass, and see whether any roots or leaves be attached to it.

17. Every specimen should be labelled on the spot, or as soon after collection as possible, and then rolled in strong paper, or any soft material, to protect its edges.

18. A heavy hammer to break off the specimens from the rock, and a smaller one to trim them into shape, are indispensable. If the larger hammer have a pick at one end, it will be found very useful in digging up and flaking off those thin shaly beds which usually contain the best preserved shells, &c. A chisel or two are also desirable.

19. The recommendation expressed in the instruction No. 1. may be repeated:—That it should be a general maxim with geological collectors to direct their principal attention to the procuring of fossil organic remains, both animal and vegetable. These are always of value when brought from distant countries, especially when their localities are care-

fully marked; but when the rocks contain no petrifactions, very small specimens are sufficient.

*** All boxes to be addressed to W. Lonsdale, Esq. Curator, Geological Society, Somerset House, London.

Apartments of the Geological Society, Somerset House, London, February 19, 1830.

ASTRONOMICAL AND METEOROLOGICAL.

PROFESSOR HANSTEEN'S JOURNEY TO SIBERIA.

PROFESSOR HANSTEEN, in a letter to Professor Shumacher, dated Irktuz, 11th April, states, that "it is difficult to find a sky more favourable to astronomical observations than that of eastern Siberia. It is constantly serene from the moment when the River Angara, which flows out of Lake Baikal, is covered with ice, to the month of April. In a cold of from 30 deg. to 35 deg. of Reaumur, the sun rises and sets clear, free from the red mist in which its disk appears enveloped to us, when near the horizon, during the winter. Moreover, its action is so powerful, in spite of the intense cold, that the roofs of the houses are often seen dripping in a temperature of from 20 deg. to 30 deg. below zero. The latter degree of cold is more supportable here than that of 15 deg. with us, seeing that the air is always calm and dry. When we left Tobolzk, on the 12th December, the cold was constantly from 20 to 30 to 34 deg. We are obliged to cover our instruments with thin leather, otherwise, on touching them, a pain was felt like that from a burn, and a white blister was produced on the skin."*

ATMOSPHERICAL ELECTRICITY.

WE quote from *Brewster's Journal*, the following important observations on the differences in the electricity of atmospherical precipitations according to the directions of the winds.

At the instant of the precipitation of the vapours contained in the atmosphere, positive electricity seems to be first developed, and the negative appears to proceed often from the influence of the first. The precipitations which first take place, whether storm or temporary rain and snows, are commonly positive, and are soon followed by negative electricity of nearly equal intensity. This alternation often takes place several times, while, on the other hand, we see the drops of rain, hail, hoar-frost, or flakes of snow vary every instant in their size, their density, and their continuity. At the termination, the density becomes weaker and

* Jameson's Journal.

weaker, and finally remains negative; sometimes after the storm a shower falls which possesses negative electricity.

It is not common, however, to see rains which fall regularly and continuously, show, from their commencement and during several days, only negative electricity. This fact, joined to the weak intensity which this species of electricity generally possesses, seems favourable to the opinion that it is most frequently owing to the partial evaporation which drops of rain experience during their fall. These drops form a species of evaporable base, which becomes negative by the very circumstance of the evaporation. This explanation seems to be confirmed by the observation of a fact which is owing probably to the same cause, viz. the strong electricity of the fine aqueous spray which occurs at the foot of cascades, and which is sometimes so strong near great cascades that the electrometer diverges more than 100 deg., as I have had occasion frequently to observe in the cataracts of Switzerland.

This explanation agrees also with the greater frequency of negative showers by south winds, and of positive ones by north winds. A current of warmer air, and one consequently more light and more elevated, in the first case ought to facilitate the evaporation of drops of rain during their fall; while, by the colder north wind, which is heavier and nearer the surface of the earth, the clouds have in general a lower position, and the evaporation of the drops of rain is less easy and almost nothing.

It follows, also, from the preceding observations, that we should be often wrong in inferring from the negative electricity of rain the negative electric state of the cloud from which the rain proceeds: for it may happen, that, coming from clouds slightly positive, it becomes negative during its fall by the partial evaporation of its drops. This I have been able to verify by direct observation in a journey which I made in the Alps. Being upon the Righi on the 10th and 11th July at a height of 5,140 feet above the sea, I found, by sixteen observations made at different times of the day, that the rain which fell during two days was constantly negative; but as soon as the rain ceased a little, the clouds themselves, with which I was surrounded, were charged with positive electricity. The great intensity of the electricity, the distinct manner in which the two electric principles alternately predominate during north and east winds, seems to arise principally from the dryness which exists in the strata of air, while the whole of these winds reign in the atmosphere; to which we must add the situation of the clouds, brought by the force of these winds near the surface of the earth, and the electricity of which may then naturally exert on our instruments a perceptible influence.

VISITATION OF GREENWICH OBSERVATORY.

The annual visitation of the Royal Observatory at Greenwich has, for nearly 150 years, been confided to the Council of the

Royal Society and to such other persons as they might from time to time invite for that purpose, by virtue of the King's warrant directed to them at the commencement of every reign. His present Majesty, however, has been pleased to make a totally new arrangement on this subject. But, before we enter on the cause of this alteration, we would remark that when this annual visitation was first established, Flamsteed was greatly offended; inasmuch as he considered that the Council of the Royal Society (with whom he was not on the best terms) was thus set over him as a sort of spy upon his actions. It has however been silently acquiesced in by his successors; but, whatever, importance it might at a more early period have possessed, it has gradually declined from its original object, and ceased to answer the purpose for which it was designed; for little or no business was done at the meeting: and if any matter requiring consideration was brought forward, it was always turned over to the Council of the Royal Society, where it was usually lost sight of, and altogether forgotten or neglected.

A representation of these circumstances was made in the proper quarter: and His Present Majesty has been pleased to appoint a new set of *Visiters;* and has at the same time enlarged the powers hitherto granted to that body. By this warrant (which is dated last month) the President of the *Royal Society,* and five individuals nominated by him, together with the President of the *Astronomical Society,* and five individuals nominated by him added to the Savilian Professor of Astronomy at Oxford, and the Plumian Professor of Astronomy at Cambridge, are now appointed the regular and permanent Visiters of the Royal Observatory.*

SNOW OF THE WINTERS 1829-1830.

M. HUBER BURNAND was induced to pay particular attention to the character of the snow which fell last winter at Yverdun, during the months of January and February, in consequence of certain singular appearances which had not before been observed. He had also remarked the same character on the 21st, 22nd, 23rd, and 24th of January, 1829, which were very cold days. This snow was crystallized in stellar pallets, with six rays, along which were disposed other filaments arranged as in feathers, and these again supporting other finer filaments similarly arranged. The angles were sixty degrees, the pallets were extremely thin, perfectly plane, and quite regular in form.

Previous to the 2nd of January of the present year, the quantity of snow of this kind which had fallen was but small, but on the 2nd, 3rd, and 4th of January the quantity was so great, all of the same kind, as to attract general attention; every body was talking of it, and comparing it to feathers. M. Huber-Burnand

* Philos. Mag. No. 49, which see for a Copy of the Warrant.

ventured to call it *Polar Snow*, from its corresponding to the description given of such, and it retained the name. Whenever this snow fell during the winter, it was found to be of the same kind. Five or six inches of this snow fell in the three days mentioned. It was extremely light, very dry, and without adhesiveness. Instead of presenting a swan-like whiteness, it had more the silvery appearance of feathers of the colymbus, in consequence of the high polish of its crystalline facets. When this snow was dropped freely into a basin, measured, and then melted, it gave one-forty-fifth its volume of water.

This snow fell on various occasions during the winter. In the intervals another kind fell, which was called *elementary snow*. It fell only on foggy days, and was supposed to be formed near the earth. The particles were excessively fine, not regularly crystallized. It fell as a fine powder, but only rarely. Both these kinds of snow fell at temperatures much below that of ordinary snow, namely, at ten or fifteen degrees below the freezing point.

On the 23rd and 24th November, 1829, the temperature being two or three degrees above freezing, it snowed continually for twenty-four or thirty hours, nevertheless it did not accumulate on the ground to a height of more than eight inches, because much of it melted as it fell. The water derived from it amounted to 31 lines, that enormous quantity being collected in the rain-gauge. The wind passed during the time from being violent at south-west to the north west, where it remained. The snow was heavy and full of water; it broke the branches of the trees in the neighbourhood, especially the upper ones, upon which it frequently rested to the height of more than a foot.

The hoar frost of last winter was also abundant and peculiar at Yverdun. It each day affected a different form, being sometimes in parallel fillets, or groupes, sometimes resembling leaves, at others spines, occasionally spines terminated by a flat rosette, with six divisions, &c., the spines being sometimes an inch in length. These arrangements were all alike on the *same* day. Such effects show us, that circumstances probably occur with the air of which we are ignorant, although they are sufficiently powerful to have a strong influence in certain phenomena which occur in that elastic fluid.*

WATERSPOUT ON THE LAKE NEUFCHATEL.

On the 9th of June, at nine o'clock in the morning, the weather being moist and the thermometer at 64° F., a waterspout was seen at Neufchatel, on the other side of the lake, about a league from the port. From a fixed black cloud, about eighty feet above the surface, descended perpendicularly a dark grey cylin-

* Bib. Univ.

drical column, touching the surface of the lake. Much agitation was seen at the foot and top of the column, a dull heavy sound was heard, and the waters of the lake were seen to mount rapidly along this sort of syphon to the cloud, which gradually became white as it received them. After seven or eight minutes had elapsed a north-east wind pressed upon the column, so that it bent in the middle, still however raising water, until at last it separated. At the same moment the cloud above, agitated and compressed by the wind, burst and let fall a deluge of rain. This appearance was neither preceded nor followed by any lightning or explosion; the column was vertical and immobile, no rotary movement being observed.*

THE COMET.

Extracts of Communications from Mr. Herapath and Sir J. South† to the Editor of The Times, *Jan. 25th, 28th, and 29th.*

On the 7th, at 6h 30m A.M., it was in 264 deg. 11 min. right ascension, and 12 deg. 33 min. south declination, from my observation. On the 9th, at 6h 47 m A.M. it had 261 deg. 59 min. right ascension, and 12 deg. 1 min. south declination, by the observation at Kensington Observatory; and on the 18th I found it in 252 deg. 18 min. right ascension, and 9 deg. 2 min. south declination, at 5h 43m A.M. The time was apparent or solar in each case. On the 7th the head was white and brilliant, with a tail of between 1 deg. and 2 deg. at Cranford, and the comet equalled, as I conceived, stars of the second magnitude. To Sir James South, on the 9th, the head was very luminous, and the tail about 1 deg. long; while to Mr. J. T., near Liverpool, on the 18th, the tail seemed 2 deg. or, as he informs me by letter, probably 3 deg. long, the head being bright and the nucleus well defined. On the 18th the head appeared to me much less and more confused; but the tail had extended in length to full 3 deg. and was much more apparent. At these several epochs it was about 25 deg. 29 deg. and 47 deg. distant from the sun.

From all these circumstances, it appears that the apparent motion of the comet is retrograde; that it crossed the ecliptic about the latter part of Capricorn, and is proceeding by a path rather concave towards the north, between the stars ζ and δ Ophiuchi, passing to the north of the former, and about 2¼ deg. to the south of the latter, which it will reach on the 28th inst.; that its apparent motion is decreasing, and will probably before long cease, and at length become direct; that the comet has approached nearer to the sun, and most likely to the earth too; and though its motion is now increasing towards the north, in all probability it will finish by declining towards the south. From its great elongation, it would seem the true path of the comet is without that of Venus, and that it is either between us and the sun, or on the other side of the sun. In the former case, its real motion is direct, in the latter retrograde; but

* Bib. Univ.

† It is with much pleasure that we record the knighthood of this distinguished Astronomer, with a pension of 300*l.* per annum. This was one of the earliest acts of His present Majesty, by the especial desire of the late Sovereign, expressed a few days before his death.—*Editor.*

judging from the appearance of the body, I should think it is between us and the sun.

Whether this be the comet said in the *Morning Herald* to have been predicted by the Chinese, or that of 1770, which Mr. J. T. imagines it might be, or indeed any one of the comets which have yet appeared, the present observations are not sufficient to determine. However, its great elevation above the ecliptic, and its long train, which mark it for a comet of a long period, are not, I conceive, favourable to an identity with that of 1770.

On the 7th I found it was south about 20h 21m A.M., and rose about 20 min. after 5; on the 18th it was south 10 min. before 9, and rose at about 33 min. after 3; on the 30th it will be south about 8 min. after 7, and rise about half past 1. Its place on the 18th differed, I see, only 13 min. in right ascension and about half a degree in declination, from the place it should have had by my computations from the observations of Sir James South and myself on the 9th and 7th. Should it therefore proceed as it has, on the 25th, it will be in about 244⅗ deg. right ascension, and 6⅗ deg. south declination; and on the 30th, in 239¼ deg. right ascension, and 5 deg. south declination: hence it may be easily found. Since the 18th I have not seen it.—

Jan. 26.—I this morning saw the comet for the last time I expect that I shall see it. It is diminished in splendour wonderfully since the 18th. At that time it was beautifully brilliant, but a little after 5 this morning it was totally invisible to the naked eye. The great light of the moon, no doubt, had some influence in this; but at 6, and a quarter after, when the moon had been for some time down, it could be seen by the eye at intervals only, and then as a very small star, destitute of any of the appendages of a comet. Even when viewed through a telescope, with a power of about 30, both before and after the setting of the moon it merely exhibited a nebulous appearance without, as far as I could discover, any tail or well-defined nucleus.

From these circumstances it may easily be imagined, that it was impossible to ascertain its place by the sextant. As far as I could judge it was very little to the right of a straight line adjoining ε Ophiuchi, and 17 or υ Ophiuchi, by Bode's Catalogue. It seemed to be better than one-third of the distance of these stars from υ, and not far from, but to the right of, a small star, I believe 16 Ophiuchi, which appeared in the field of the telescope. Its position appeared not to differ from the place my computation would have given it, except that I thought it was more to the south.

It is, however, evident that this body will no longer be a subject for even tolerably good instruments, but must be left to such powerful means as are possessed by the fixed observatories. One thing which surprises me is that in so short a period as 19 days it should have had such unaccountable changes. On the 7th it was a brilliant comet, with a tail of from 1 deg. to 2 deg., on the 12th from 2 deg. to 3 deg., on the 18th at least 3 deg. and by the 26th it had sunk to a tailless and almost undiscoverable star. This excessively rapid rise and diminution of splendour is, to the best of my knowledge, a novelty in astronomy and I presume must arise from some peculiarity in the comet's path round the sun, relative to that of the earth. It is therefore to be regretted that the weather has been so unfavourable as to preclude our daily tracing its successive and perhaps singular gradations.

I should now imagine this body must have passed its perihelion for

some time, probably before my second or even my first observation. In this case the greater apparent length of its tail on the 18th may have been owing to its greater elevation above the plane of the ecliptic. However, I am anxious to know what has been seen of this body on the continent; they have most likely had better opportunities of seeing further south than we have had. JOHN HERAPATH.

The following is from *The Times* of Jan. 29:—

"It was observed here on Wednesday and this morning. On the former occasion, it might, by a person knowing well where to look for it, be with difficulty detected by the unassisted eye; this morning, certainly not. In either instance, under very slight illumination of the field, it became invisible.

"At 14h 16m 38s sidereal time of Tuesday the 25th, its right ascension was 16h 14m 46s and 3-10ths; and its southern declination was 6 deg. 36m and 6s; whilst at 14h 31m 16s and 6-10ths, sidereal time of yesterday, the 27th, its right ascension was 16h 4m 6s and 2-10ths; and its southern declination 5 deg. 45m and 34s. Hence its daily diminution of right ascension, in time, is about 5m 20s and of southern declination about 25m 15s. J. S."

Observatory, Kensington, Jan. 28, 1831.*

RENDING OF TIMBER BY LIGHTNING.

SOME pieces of an oak struck by lightning have been presented to the Academy of Sciences by M. Arago, from the Duke de Chartres. One was about three feet in length, and was split into laths from two or three lines in thickness and eight or ten lines in width; the other from twelve to fifteen lines (query, inches?) was divided into a multitude of longitudinal fragments so as to resemble a broom. M. Arago, on this occasion, referred to two other cases in which carpentry had been disintegrated in a similar manner. Lavoisier said, relative to the latter, that one piece was split into longitudinal fragments so thin and numerous, as to resemble perfectly a box of alumettes. These observations, made on dry wood, show that that explication should be rejected which applied only to living wood, and which supposed that the electric fluid descended along the vessels containing the sap.†

It is well known that there is powerful expansion in the space through which an electric discharge passes. The old instrument called Kinnersley's electrometer is founded upon this effect. Now, supposing lightning to strike a tree, the mere difference of cohesion of the wood in different directions would account for the splitting into fibres, without reference to the direction of the electricity. In living or moist wood the conversion of the aqueous parts present into vapour, by increasing the expansive power, would tend to increase the rending effect; but still the wood would give way in the same manner. If, therefore, the force be enough to split the wood, but yet not sufficient to tear it to atoms, it would of necessity rend it into laths or fibres.

* Philos. Mag. † Revue. Ency.

LUMINOUS POINTS IN THE HORIZON.

The following is part of a letter to the Baron de Zach. "Permit me to communicate to you a discovery which I made about six years since, but which I did not make known to you before, until I had assured myself of its reality; I beg you to make it known, if possible, by some of the journals. For these last six years, I have been occupied in making observations on the clearness of the atmosphere by day and by night. This gave me the opportunity of remarking a singular light towards the north-east and the south-west. It very much resembles the zodaical light, but it is always observed in the magnetic meridian. It is more luminous towards the north-west, than in the south-east: even when the sky is covered with clouds, if they be equally diffused, this magnetic light may be seen towards the north-west, insomuch, that I have sometimes been in doubt whether it was not a distant fire. To be convinced of the truth of this appearance, it is only necessary that the observer should have a free horizon, and that he attend continually to the clearness of the air. It is requisite that the eyes should be accustomed for awhile to this kind of observation, that they may be enabled clearly to see the phenomenon."*

LATITUDE OF CALTON HILL.

As the Calton Hill is one of our most interesting meteorological and geological points, we are happy in having an opportunity of giving the precise position of the Observatory placed upon it. The Latitude of this Observatory, as determined by Mr. Henderson, from the data of the Trigonometrical Survey, is 55 deg. 57 min. 19 sec. 5 N.†

COMPARATIVE SEVERITY OF THE WINTER AT PARIS AND EDINBURGH.

Mr. Thomas Blaikie, a native of Corstorphine, near Edinburgh, Ingenieur des Jardins Anglais at Paris, and who has been settled for half a century in the neighbourhood of that city, mentions several striking examples of the great severity of the Parisian winter. Last winter, 1829-30, scarcely any plants of Viburnum Tinus or Laurustine, escaped with life at Paris, although this shrub was in flower during the whole winter with us. At Paris the Alaternus was greatly hurt, and strong Cypress trees (Cupressus sempervirens), were killed; large trees of the Aleppo pine (Pinus Halepensis), and of the sea-pine (P. maritima), were likewise killed. Mr. Blaikie adds, that it will seem strange to a Scotsman, yet it is nevertheless true, that in the commons near Paris, the *win* or furze (Ulex Europæus) was, last winter, killed

* Bib. Univ. † Jameson's Journ.

to the ground; while on our Blackford and Braid Hills the plant was covered with flowers in the beginning of February. In gardens about Paris, the fig-trees which were left uncovered were all killed. But what is remarkable on the other hand, and may afford a lesson to our cultivators of ornamental shrubs, large plants of Magnoria grandiflora stood without any covering; and, although the leaves were destroyed, yet the trees have shot out afresh. With us this fine species of Magnolia was first tried in the open air at Colinton House, near Edinburgh; magnificent plants of it may be seen trained against the south side of the high wall of the Royal Botanic Garden at Inverleith, under the management of Mr. Macnab, and these have yielded their noble and fragrant flowers very freely, during the present summer, though not a favourable one. This Magnolia, we doubt not, will soon be more generally cultivated in our gardens.*

CLIMATE OF NAPLES.†

From the situation of the town and Bay of Naples, freely exposed to the sea on one side, with a hot sun directed upon a slope laid out to its meridian intensity, and on the other not distant from the lofty summits of the Apennines, these spots are exposed to great and sudden changes of temperature. Hence also it is peculiarly at the mercy of the winds, each of which have their peculiar character. The north wind (Tramontana) is rather prevalent in winter, and is cool, as also the north east and east, (Greco and Levante,) which blow with considerable violence from the Apennine range. The south east, or Sirocco, is not unfrequent at all seasons; and in my opinion is, at least during winter and spring, not less oppressive than that so much complained of at Rome. It blows sometimes even with violence, yet still preserves its depressing and unrefreshing character, high temperature, and dampness: it is said sometimes to convey the sand of the African deserts to the shores of Italy. The Libeccio or south west wind, blowing the whole western mass of the Mediterranean towards the mouth of the Bay, and coming in violent squalls, raises in a few minutes the most violent tempests, the rapidity seeming the work of magic, and rendering the navigation of the Bay frequently dangerous, as those who have had any experience in its treacherous surface must be aware. Spring is the least defined of the Neapolitan seasons; but this very fact is the principal boast of the climate, for of few others can it be correctly said

> "Hic ver assiduum, atque alienis mensibus æstas."

* Quart. Journ. Agriculture.

† From the conclusion of a valuable series of papers, by J. D. Forbes, Esq., in Brewster's Journal.

The mild winter, insufficient to stop the course of vegetable growth, rushes into the splendour of the Italian summer. Intolerable as is the heat of the sun at the latter period, when unaccompanied with fresh breezes, the mild winds of the west predominate so much, as to render the climate far from insupportable, and on the coolest shores of the Bay, as at Ischia and Sorrento, nothing but delightful. At Naples itself the ordinary temperature of the height of summer is from 77 deg. to 84 deg., hardly ever rising to the extremes given in the table, and never continuing at them. The winter is mild, but rainy, especially in November and December. I have given in this Journal for July 1828, a meteorological register for part of those months, showing the unsettled weather which characterizes them. After Christmas there is generally some cold weather, during which Vesuvius and the Apennines get a coating of snow, which, however, rarely falls, and hardly ever lies a day in the capital. The thermometer has been known to fall to 23 deg. Fahr.

HAY CONVERTED INTO A SILICEOUS GLASS BY LIGHTNING.

In the summer of 1827, a rick of hay in the parish of Dun, near Montrose, was set on fire by lightning, and partly consumed. When the fire was extinguished by the exertions of the farm-servants who were on the spot, there was observed in the middle of the stack a cylindrical passage, as if cut out by a sharp instrument. This passage extended down the middle of the stack to the ground, and at the bottom of it there was found a quantity of vitrified matter, which there is every reason to think is the product of the silex contained in the hay which filled up the cylindrical passage. The existence of silex in the common grasses is well known, and the colour of the porous and vesicular mass is very like that which is obtained from the combustion of siliceous plants. We have been indebted for a specimen of the substance to Captain Thomson of Montrose, who examined the spot almost immediately after the accident had taken place.*

OCCULTATION OF ALDEBARAN BY THE MOON.

On July 15th, at 23h. 44m. apparent time, Aldebaran was observed here to disappear behind the moon's enlightened limb, about two degrees to the left of her vertical point, and reappeared on the 16th at 31m. 20s. apparent time, a little below the centre of her western limb. Aldebaran as usual advanced upon the moon's enlightened limb at least four seconds of time, where it was distinctly seen before it disappeared. The refraction of the atmosphere alone, it is supposed, is not sufficient to account

* Brewster's Journ.

for this phenomenon. An interesting explanation of it by M. du Sejour may be seen in Vince's Astronomy, vol. i. p. 388.

What renders this occultation of Aldebaran peculiar, is its having occurred at noon; yet with the best power of an achromatic telescope the immersion and emersion were distinctly observed.

In the morning of the 6th of October, at 6h. 46m. 21s. apparent time, an immersion of Aldebaran behind the moon's enlightened limb, about 22 deg. on the right of her vertex, was observed at Gosport. Aldebaran appeared on the moon's limb nine or ten seconds before it finally disappeared, but this unusual time was owing in a great measure to the oblique immersion of the star, and the consequent small chord which it had apparently to describe.

The exact time of the immersion was not observed, it having taken place several minutes sooner than the computed time; but it could not have exceeded a few seconds before or after 7h. 2m. apparent time here. Missing the time of the emersion was regretted, as it might have been of some service to those who had taken the trouble to compute the occultation.*

THE PLANET MERCURY.

THE planet Mercury was seen here (Gosport) with the naked eye soon after sunset in the evenings of the 12th, 15th, 16th, 18th, 23rd, 24th, and 26th instant, and on each evening his scintillation was attended with pretty strong rays of light, particularly on the 18th, when the twinkling was not much inferior to that of ξ Tauri, which star was about four degrees distant from him, and of the same apparent magnitude. From the twinkling appearance of this planet, it is difficult to trace him out accurately among the fixed stars of the same apparent size, when at or near his greatest western or eastern elongation, without the aid of a telescope; and then he shines like the other planets, with a steady light, and with a whitish and nearly dichotomized disc.†

AURORÆ BOREALES.

IN the evening of the 20th August, between 8 and 9 o'clock, a bright light appeared in the northern horizon, and continued to rise and fall till twenty minutes past 9, when it occupied a space of 75 degrees: and at this time the first column of light, being thin and of a flame-colour, rose from its base nearly under Polaris, and was followed by many other columns from half to 3 degrees in width, some of which ascended upwards of 30 degrees About 10 o'clock the greatest display of coruscations happened, when eight or ten distinct columns of light, nearly equidistant

* Philos. Mag. † Ibid.

from each other, appeared at one view, and several small meteors showed themselves above the aurora, whose approach was indicated immediately after sunset by a fine rose-colour in the northern horizon, the same as the last was on the 19th of last April. During its continuance for three hours, the sky was perfectly clear, except a dark haze, consisting of falling dew all round the horizon, about 5 degrees in altitude, which was particularly distinguished in the space occupied by the aurora.

In the evening of the 7th September this interesting meteoric phenomenon was observed at Gosport, from fifteen minutes before till a quarter past nine o'clock, when the moon rose, and her light overpowered it. The aurora was rather faint, and it only extended from the N. to the N W. point of the horizon, yet there rose from its base about twelve columns of light with other coruscations; and one meteor appeared over it. There was also a faint appearance of the aurora the following evening, but large black clouds intervened. In the evening of the 17th the Northern Lights again appeared, from eight till a quarter past nine o'clock: during the first half hour, many bright flame coloured columns rose in slow succession, some of which attained the same altitude as the star Benetnasch in Ursa Major, and were two degrees in width. Four meteors occasionally appeared over them. The aurora then settled into a segment of mild light, and extended from N. by E. to W. The heavy dew and low passing cirrostratus clouds were unfavourable to its continuance.

At 20 minutes past 7 o'clock in the evening of the 5th of October, an aurora borealis suddenly rose between the N. by E. and N.W., a little above the edge of a dark *cirrostratus* cloud, which was seven or eight degrees above the horizon: after remaining a steady arc about ten minutes, several thin columns of light emanated from it, and two meteors passed under Ursa Major. A few minutes before eight, two or three more coruscations rose from the aurora, which was perceptible till after the moon rose.

At ten o'clock in the evening of the 16th an aurora borealis again appeared, from which several wide red columns emanated between the true and magnetic north, and rose to the same altitude as the star β in Ursa Major. The aurora disappeared in half an hour, and one meteor fell near the Benetnasch. It also appeared the following evening, but without any coruscations; and two meteors appeared over it.*

JOURNAL OF THE WEATHER

Kept at High Wycombe, Bucks., Lat. 51 deg. 37 min. 44 sec. North, Long. 34 min. 45 sec. West, during the year 1830, with

* Philos. Mag.

Monthly Observations. By James G. Tatem, Esq., Member of the London Meteorological Society.

TABLE OF THE THERMOMETER AND BAROMETER.

Month.	Thermometer.				Barometer.			
	Mean	Greatest variation	Greatest Heat.	Greatest Cold.	Mean.	Greatest variation	Greatest Height	Lowest extreme.
January - -	28.92338	24 92338	37.75	4	29 71849	1 21849	30 3[illegible]	28.50
February - -	32 95535	30 70535	55	2 25	29.62875	0.50875	30 08	29 12
March - -	43 38508	21 61192	68	27 25	29 82376	0 68376	30 34	29 14
April - - -	49 36041	28 38959	74 75	20 25	29 502	0 572	29 95	28 93
May - - -	51 05645	26.94355	78	31 25	29 60677	0 56677	30 03	29 04
June - - -	52 16250	21 5375	74	35	29 56441	0 42141	29 85	29 11
July - -	59 51612	22 98388	82 50	40 5	29 6902[illegible]	0.51031	30 08	29.18
August -	53 96774	20 03226	74	34	29 62709	0 52709	29 98	29 10
September -	50 11041	17 88959	68	32 50	29 51877	0 55877	30,10	28 96
October - -	47 52217	20 97783	68 50	28	29 95[illegible]8	0 5358	30 20	29 42
November -	41 01791	16 79791	56.75	24 25	29 55655	0 73655	30 15	28.82
December	31 54032	21.79032	46	9 75	29 03784	0 38785	30 19	28.65
For the Year	4[illegible] 98732		82 50	2 25	29 60251		30 35	28 50

TABLE OF RAIN, SNOW, FAIR DAYS, AND WIND.

Month	Number of fair days	Number of rainy days.	Number of snowy days.	Rain.	Winds							
				In. Decl	N. E.	East.	S E.	South	S W.	West	N.W.	North.
January - -	3	11	17	2 61375	4		5	4	4	3	8	3
February - -	8	5	15	2.36875	1	2	5	2	9	3	6	
March - - .	5	1	25	0 725	3	5	1	1	10	9	1	1
April - - -	14	—	16	3 19375	2	3	1	4	12	4	4	
May - - - -	11	—	20	3 75	2	5	1	2	6	9	2	4
June - - - -	15	—	15	4.11875	1	1	1	1	12	4	8	2
July - - - -	10	—	21	2 45475	3	1	5	4	10	7	1	
August - - -	15	—	16	2 43075		1	2	1	8	11	7	1
September -	18	—	12	3 525			3	2	11	8	6	
October - -	10	—	21	1,1375	4	4	3	2	5	7	4	2
November - -	16	—	14	3 01275		6	7	8	4	4	1	
December - -	11	5	15	1 695	6	7	1		5	4	7	1
For the Year -	136	22	207	31 02575	26	35	35	31	96	73	55	14

January. The severity of the cold during the month was remarkable; the minimum of the thermometer 28 degrees below the freezing point, and the mean was much lower than for the last seven years. The barometer has not been so high since 1826, and the range was the contrary of that noticed last month, being nearly two inches. Snow fell on the 11th, 12th, 13th, 19th, 20th, 21st, 23rd, 27th, 29th, 30th, and 31st, and sleet on several other days. The whole, if added together, would give a depth of 19 inches. The rain and melted snow measured 2.61375 inches. A partial thaw commenced on the 25th and 26th, but the frost returned on the following day. The evaporation 0.0625 of an inch.

February. The early part of the month was very cold, attended by snow. On the 5th, at night, the thermometer stood at 2 deg. 25 min.,

which was much colder than for many years in the same month. A thaw commenced on the 7th, and rain fell on eight different days; the greater part on the 7th and 8th, and on the 21st and 22nd. The whole quantity of rain and melted snow 2.36875 inches, which was more than since February 1826, which was remarkably wet. There were five snowy days, and the whole depth was about 4.5 in. The mean of the barometer lower than last year, and the range less than usual. The evaporation 0.08125 of an inch.

March. The month was particularly fine, and the thermometer rose to a height not experienced at Wycombe during the last seven years: the mean temperature was also much above those of the same period. The last six days had more the appearance of summer than of spring; but in the night of the 31st an extraordinary change took place, and rain, sleet, and snow fell. The whole quantity of rain and melted snow was small for the month, though much more than last year. The barometer was considerably higher than usual, and the mean 0.24 of an inch above that of March 1829. The evaporation 0.55625 of an inch.

April. Rain fell on fourteen days, and the quantity was great for the season, though not equal to what was experienced in April last year, which was an extraordinarily wet month. The mean temperature considerably higher than since 1825, and the extremes of heat and cold greater than in any one of the corresponding months of the last seven years. The barometer was generally higher than for the last two years, although the maximum did not reach the average. A rainbow seen on the 23rd, about 3 P.M., and soon after thunder was heard. The evaporation 0.475 of an inch.

May. The month was not so warm as in the last two years, although the maximum was much higher than usual, and the range 47 deg. The barometer has not been so low in the month of May since 1827, as it respects the extremes, and the mean was less than last year. The quantity of rain was remarkably great, much more than in any of the corresponding months of the last seven years, and more than seven times as much as in May 1829. On the 21st thunder was heard about midnight, attended by vivid lightning: there was also a slight thunder storm on the 23rd, about 3 P.M., with very heavy rain. Large hail on the 30th, in the afternoon, during a squall, attended by thunder and some lightning. The evaporation 0.46875 of an inch.

June. So wet and cold a June, attended by so great a depression of the barometer, has not occurred during the last eight years. The quantity of rain was extraordinary, exceeding, by upwards of half an inch, the quantity which fell in the same month last year, which was noticed as being particularly great, the mean temperature was upwards of 2.75 below the average of the last seven years, On the 25th there was much lightning all round the compass from 8 P.M. until midnight, but the thunder was not loud. An indistinct lunar halo observed on the night of the 2nd, about 10 P.M. The evaporation 0.21875 of an inch.

July. The commencement of the month was extremely wet, and the greater part of the rain fell in the first eleven days, but the whole quantity was little more than half of what fell in July last year; the latter end of the month was very fine, and the thermometer rose higher than 1826; the barometer was also above the maxima and means of the last two years. Thunder heard on the 3rd, 7th, and 30th, and lightning seen on the 29th to the northward. An indistinct rainbow seen on the 9th. The evaporation 0.69375 of an inch.

August. The latter end of the month was particularly cold, even colder than in August last year, and although the quantity of rain was not one half of what fell in the same month in 1828, and very considerably less than the quantity last year, yet the mean temperature was lower than any one for August in the last eight years, the greatest elevation of the barometer the same as in the corresponding month last year, and the mean rather higher, but low for the season. Thunder heard, and lightning seen, on the 9th, about 2 P.M. The evaporation 0.3125 of an inch.

September. Although rain fell on nearly as many days as in September last year, the quantity was almost an inch less, and very little for the month. The mean of the barometer below the usual average, yet higher than last year, as were both the extremes; the temperature generally low, and on the night of the 21st only half a degree above the freezing point, which was lower than the thermometer has been in September since 1824. Thunder was heard on the 14th, about 3 P.M. The evaporation 0.13125 of an inch.

October. The month was uncommonly fine, the quantity of rain considerably less than during the last eight years, the mean temperature higher than since 1827, and the maximum above any observed at Wycombe, in October, during the journalist's residence; the barometer was also remarkably high, the mean 29.9558, and the maximum exceeding that in the corresponding month in 1825, which was considered extraordinary for the season. A rainbow seen on the 25th, about 3 P.M. On the 28th and 29th the wind blew strong from the S.W. and W., but could not be considered as violent gales. The evaporation 0.125 of an inch.

November. Thirteen days of the month might be denominated fine, and the thermometer reached an elevation above any one in the same month during the last seven years, while the mean temperature was nearly 4 deg. higher than in November last year. The barometer was generally low, and the mean gave a depression greater than since 1826; the quantity of rain much greater than usually falls in the month, indeed more than since 1825. Lunar haloes were seen on the nights of the 25th and 27th, and a faint aurora borealis was observed on the 17th, about 11 P.M. The evaporation 0.13125 of an inch.

December. The mean of the barometer was lower than any one in December during the journalist's residence in Wycombe, and the range of the thermometer greater than in the same month for the last eight years, while the mean was lower, except in last year, than any in the corresponding month, for the same period: of the quantity of rain and melted snow, the like report must be made as of the mean of the thermometer. Snow fell on the 12th, 15th, 22nd, 24th, and 27th; the whole quantity not more than 2.25 in. On the night of the 11th a beautiful aurora borealis was seen for several hours; about one o'clock on the following morning it assumed the form of an arch, of great brilliancy, surmounted by a brown tint, which faded away into silvery light, something resembling that afforded by the moon before she appears above the horizon, a deeper brown colour filled up the space beneath the luminous arch; another but very faint aurora was observed on the 15th. Lunar haloes seen on the nights of the 23rd, 24th, and 26th; that on the latter night was remarkably bright, and well defined. The evaporation 0.0625 of an inch.

METEOROLOGICAL SUMMARY OF 1830.*

	Temperature. Max	Mean	Min	Mean Pressure	Prevailing Winds	Highest Dew Point	Ci	Wane Cl	Stacken Cl	Sonder Cl.	Twain Cl	Rain
JANUARY	48		29.	29.40	N. and N.E.	34.5		.			.	
FEBRUARY	53		37.	29.70	W. and S.W.	34.4		.	.			
MARCH	68		46	29.82	W. and S.W.	39.2	.	.	.			
APRIL	76		50.	29.43	S. and S.W.	43.5		.	.		.	.
MAY	82		60.	29.57	W. and S.W.	62.1		.	.	.	.	
JUNE	80		63.	29.95	S.S.W. and N.E.	70	.	.	.			.
JULY	86		67	29.70	E., W. and S.W.	67.1		.	.	.	.	.
AUGUST	80		62.	29.57	W. and S.W.	69	.	.	.			.
SEPTEMBER	71		54.	29.60	S.W., W., N.	65		.	.	.	.	.
OCTOBER	65		49	30.08	E.S.E.N.W.W.	66.1		.	.			
NOVEMBER	61		35.	29.51	S.E. and S.W.	60		.	.	.		.
DECEMBER	49		30	29.53	E., S.E., N.	53.1		.	.		.	

The modification of Cloud which prevailed during the month is signified by a dot.

The maximum and minimum of temperature are ascertained from a self-regulating Thermometer.

* Communicated by Dr Armstrong, Surrey.

RURAL ECONOMY.

Cure of Wounds in Elm Trees.—Those elms which have running places, or ulcers, may be cured as follows:—Each wound is to have a hole bored in it with an auger, and then a tube penetrating an inch or less, is to be fixed in each. Healthy trees which are thus pierced give no fluid, but those which are unhealthy yield fluid, which increases in abundance with the serenity of the sky and exposure to the south. Stormy and windy weather interrupts the effect. It has been remarked that in from twenty-four to forty-eight hours the running stops, the place dries up, and is cured.—*Journal des Forets.*

Pasturages, their importance, and their extent in different countries.—M. Moreau de Jonnès lately read to the *Academie des Sciences*, a memoir, entitled, "Statistical Inquiries respecting the nature and extent of Pasturages in the different parts of Europe." The author first exposed the defects of the systems in which the subsistence of nations is left dependent upon the uncertain chances of the grain crops. The frequent famines from which all the countries of Europe have, for a great number of ages, suffered, attest the unavoidable danger arising from these systems. A new system of agriculture has been introduced within a century, and gradually improved among different nations, especially in England, where it has produced the happiest results. Not only has the proportion of land devoted to pasturages been greatly increased, but this land has been rendered incomparably more fertile of vegetables adapted for the food of cattle. The influence of this happy modification appears to have been immense. To form an estimate of its extent and power, M. Moreau de Jonnes, passing in review the different nations of Europe, showed that the agricultural and commercial prosperity of the inhabitants is every where proportionate to the extent of the land left under pasture, whether in improved natural meadows, or in artificial meadows. England holds the first rank among the European nations in both these respects, and the lowest is Spain, where the cultivation of artificial meadows is entirely unknown. The author particularly compared England and France. There results, from important documents, that the latter country is a century behind the former, and that, to equal the English, the French will have to go through the immense improvements which have, in that period, more than doubled their agricultural prosperity and general well-being. England not only surpasses France in respect to the number of cattle, but the animals there are much finer, and their flesh is of better quality; so that the inhabitant of England may, on an average, use for his food a quantity of animal substance nearly the double of what France furnishes to each of her inhabitants, and this quantity is moreover of superior quality. From the numerous facts adduced by M. Moreau de Jonnès, in his memoir, he drew the following conclusions: 1st, That pasturages, which are necessary for the existence of cattle, are one of the essential elements of the wellbeing of man, of the agricultural and commercial riches of state, and of the civilization of nations; 2ndly, That they become eminently productive only after the assiduous and persevering cares of human industry, and that they abound in species capable of affording nourishment to cattle only after their conversion into artificial pastures, or after the destruction of useless or pernicious plants, which,

in every country, overrun the natural pasturages; 3dly, That, in defect of the employment of these means of prosperity, there is a loss of three-fourths in the development and fattening of pasturing animals, and that then, as in the provinces of France, the mean quality of meat furnished for consumption by a hectare of pasturage does not exceed 98 lb., in place of rising to 400; 4thly, That, on the contrary, by the use of these means, there are obtained 300 lbs. of animal food from a hectare of improved natural meadows, and 400 lb. from the same surface in artificial meadows; that, estimating only at the rate of 30 centimes the lb. of meat, and the products of cattle and sheep, leather, wool, butter, milk and cheese, the produce of the hectare is 49 francs when in unreclaimed pasture, 150 francs when in improved pasture, and 200 francs when in artificial meadows; 6thly, That consequently the 5,775,000 hectares, at present left in France to pasturing animals, produce only a revenue of 282,000,000 francs, whereas if they were converted into improved meadows, they would yield 863,000,000 francs, and into artificial meadows, a third more; 7thly, That such an increase of riches, rendered attainable by care being bestowed upon the pasturages, raises to the highest rank of economical and agricultural improvement those from which so important results might be expected; 8thly, That the improvement of pasturages, which is the necessary condition of that increase of prosperity, requires a thorough investigation of the geographical distribution of pasture plants, and careful researches for discovering by what secret operations nature peoples the pasture grounds with useful or noxious plants, and by what means the multiplication of the former may be favoured, and the spreading of the latter prevented. With this twofold object, the author announced that he had made researches, by means of experiment and observation, tending to the solution of the following questions: 1st, What are the local causes of the difference of pasture plants in the different natural meadows of the same country? 2dly, What are the original causes of this complicated phenomenon? 3dly, What are the means of improving and enriching the the indigenous flora of pasture grounds?—*Le Globe.*

On the application of Vinegar to Cattle inflated by an excess of green food.—It is found that the gastric tympany, or the inflation which sometimes takes place in the stomachs of horses, cows, or sheep, in consequence of an excess of green food, and of the gas thereby produced, and which cannot escape, may be frequently relieved by vinegar, which puts an end to the production of gas.—*Quart. Journ. Agric.*

Beneficial effects of Chloride of Lime and Chloride of Soda, when applied to external diseases of the animal system.—The chloride of lime has been found by Mr. Alcock to be an excellent disinfectant. Of the chloride of soda he thus speaks:—"The chloruret of oxide of sodium, in common with that of lime, has been shown to possess the valuable property of destroying the most putrid effluvia arising from animal substances, even when these effluvia are diffused to a considerable extent in the surrounding atmosphere: it has also the property, when applied to the substances giving of these effluvia, of arresting or destroying the progress of putrefaction. Not only does it possess this power with regard to dead and detached animal substances, but in those distressing forms of disease in which a part or parts of the living human body become dead and putrid, whilst yet attached to the contiguous tissues which preserve their vitality, it has the inestimable power of speedily ameliorating this

most loathsome condition, by destroying the putrid odour emanating from the dead portions; and it, moreover generally arrests the further progress of decomposition, and promotes the more speedy separation of the dead parts from the living, than can be obtained by ordinary means. It very often is capable of changing the nature of malignant, corroding and destructive sores, in the condition of simple ulcers: in many ulcers not malignant, it is capable of greatly hastening the cure. In short, though not an infallible remedy, it is capable, under the guidance of medical and surgical skill, sound judgment and experience, of alleviating, and often of totally removing, some of the most distressing and loathsome diseases to which animals are liable." If the cloride of soda be thus useful in human surgery, it will not, probably, be quite inert in the quadruped. We have used it with manifest advantage in a case of fistulous withers, the putrid stage of distemper in dogs, and ulcerations of their lips and gums. A French veterinary surgeon, M. Lard, in the spring of 1805, cured a glandered horse with it; and another military veterinary surgeon, M. Etienne, was most successful in arresting the progress of several diseases among the troop-horses at the barracks of Moulins. The bad forage and situation of this place subjected the horses to attacks of glanders and farcy. Every attempt to arrest these maladies proved abortive, until M. Etienne used the chloride of soda. He diluted the solution of the chloride with twenty-four times its weight of water, and bathed the ulcers with it, and ejected it into the nostrils. The defluxion rapidly decreased, and in thirty-five days the animals returned to their work. The usual means of treating these diseases were continued at the same time, but these were perfectly ineffectual before the chloride was used.—*Veterinarian.*

Substitution of Iron for Poles in the cultivation of the Hop.—M. Denis, member of the Society of Agriculture of the Vosges, has published a treatise on the cultivation of the hop; in which, founding upon his own experience, he recommends the substitution of iron wires for poles for the training of the plant. These wires, formed in pieces of about three feet in length, and joined together so as to resemble a surveyor's chain, are suspended horizontally between two posts of oak, placed at the extremities of the lines of hops, and supported by wooden props at regular intervals. The hops are planted at the distance from each other of eight feet, and are each left with four shoots, which are conducted by little rods to the iron chain, along which are trained two in each direction. M. Denis computes that by this practice about a fifth part of the original cost of poles is saved, and 50 francs per annum afterwards for each 500 square mètres.—*Bul. des Sciences Agricoles.*

To ascertain the Quality of waste Land, from the Nature of the wild Plants that grow in it.—Grey lichens indicate the most barren kinds of soil; and such land, planted, will only produce bushes. Coarse bent-grass denotes a stiff poor soil, inclined to wet; fit for the alder, native willow, and spruce, with a few birches. Dry soil, with thick and healthy heath, and without grey moss or bent-grass, "is capable of producing a good average crop of larch, birch, and Scotch pine. Oaks, likewise, may be planted in it with success; but it is too poor for the ash, elm, beech, or sycamore." Broom is an unequivocal criterion of superior fertility. The furze or whin springs up on the best, as well as on the worst, of soils: when dwarfish, the soil is poor; when gigantic, dry and rich. Abundance of fern indicates the most fertile quality of any soil that is to

be met with in an uncultivated state. Few trees will grow freely where slate abounds, or over freestone that lies near the surface."

Thinning.—To thin out large trees from among smaller ones, without injuring the latter, adopt the following mode:—Fix a rope "At such a height on the top of the tree intended to be cut down, that the weight of the part below may considerably exceed that of the part where it is made fast. The ends of the rope are then to be tied firmly round the trunk of some one of the neighbouring trees to windward. By this contrivance, the tree which has the rope fixed amongst its branches, will, when cut through, instead of falling to the ground, remain suspended, and may be easily guided to whatever side may be requisite to keep it from injuring any of its neighbours in coming down. The rope being then untied, the tree will prostrate itself harmlessly on the earth." When thinning has been delayed till the trees have suffered considerably from want of air, the application of it will then be productive of harm rather than good. In the case of pines and firs, it is better to let the stronger trees make room for themselves by destroying the weaker.—*Cruickshank's Practical Planter.*

Field Turnips.—The first, second, or third week in October pull up every turnip in the farm, whether they have done growing or not. if they have not, all the better. Lay them carefully across the top of the ridges or drills; let them remain in this state a week or a fortnight before cutting off the tops and tails. The grand advantage of this leaving on the tops is, that the roots become doubly nutritious, as well as doubly durable. A gardener can understand all this from saving his bulbs, from taking up his potatoes while the stems are yet growing, and from gathering his keeping fruit before it is fully ripe.—*Country Times*, Nov. 1. 1830.

Malt—may be said to yield a revenue to the country only in so far as it is made for the brewing of beer, because the duty on that which is made into spirits, independently of the quantity being small, may be considered as nearly all returned to the distillers in the form of a drawback. When the beer is brewed by public brewers, it is chargeable with a duty varying from 9*s.* to 9*s.* 10*d.* per barrel on strong beer, 4*s.* 11*d.* per barrel on intermediate beer,* and 1*s.* 9½*d.* to 1*s.* 11½*d.* per barrel on table beer; but when brewed by private individuals for their own use, no beer-duty is chargeable. The malt and beer duties, then, taken together, may be regarded as a tax on the beer consumed by the community, who thus pay both a malt-tax and beer duty when the beer is made by brewers, and a malt-duty only when brewed by private individuals. To enable our readers to form a proper idea of the extent and importance of the malt and beer duties, and of the annual revenue which arises from them to the country, we have prepared the following statement, which is made up on an average of the five years preceding the 5th January, 1828. In this as well as in other similar details which are given in this paper, we have adhered as much as possible to round numbers, and we have avoided all minor and immaterial corrections, which might tend to perplex the reader, without at all affecting the general results. The whole of these details are taken from official documents laid before Parliament principally in session 1828, and to these we refer generally for a corroboration of any statements of the kind which we may give.†

* This is a description of beer made by the retail brewer in England, and the consumption of it is very inconsiderable, as will afterwards be more fully seen.

† Abridged from a valuable Paper in the *Quarterly Journal of Agriculture.*

The average Annual quantity of Malt made, and Duty paid thereon during the period referred to was, in

	Quarters	Duty.
England,	3,426,256	£.3,480,992
Scotland,	341,806	334,187
Together,	3,768,062	3,815,179

Of this quantity of Malt there was made into Beer by licensed Brewers and Victuallers, who paid Beer-duty, in England,	Qrs. 2,673,147		
Scotland,	78,690		
		2,751,837	
Leaving the quantity of Malt which paid no Beer-duty, and which was apparently applicable to the manufacture of home-brewed Beer and Spirits,		1,016,225	
The quantity of Malt made into Spirits, and the amount of drawback paid to distillers thereon, was		367,853	238,789
And there thus remains the quantity of Malt which was apparently applicable to the manufacture of home-brewed Beer, and the whole amount of Revenue arising from the Malt-tax,		Q.648,372	£.3,576,390

The Revenue arising from the Malt-tax and Beer-duty taken together, then, may be stated as follows:—

1. Duty on Malt made into Beer by Brewers, being 2,751,837 quarters, at the rate chargeable thereon, is		£.2,843,564
And the Beer-duty, taken for the average of the five years, was, in England,	£.3,280,030	
Scotland,	81,386	
		3,361,416
Revenue from Beer made by Brewers,		6,204,980
2. Duty on Malt which pays no Beer-duty, being 648,372 q.		669 984
Whole revenue from Beer		6,874,964
3. Duty on Malt made into Spirits,		62,842
Whole Annual Revenue from the Malt-tax and Beer-duty,		£. 6,937,806

Advantage of Short Stages in Drawing Heavy Loads.—Mr. Stuart Menteath of Closeburn, proprietor of one of the richest coal-fields in the island, both as to quantity and quality, has very successfully employed horse power to the drawing of heavy loads, by dividing the road into short stages. Before this expedient was resorted to, each horse could travel the distance of only 18 miles, and return with a load of 24 cwt. thrice a week; that is to say, the aggregate of the labour of each horse amounted

to 3 tons 12 cwt. weekly. But by dividing that distance into four stages of $4\frac{1}{2}$ miles each, four horses can make three trips daily, and draw a load of 33 cwt. each trip, or very nearly 5 tons daily, or 30 tons weekly. Hence, according to this method, the aggregate of the labour of each horse amounts to above 7 tons weekly. Suppose 16 horses are employed, instead of making them travel 18 miles one day, and return with a load the following, the more advantageous plan is to arrange them in four divisions, and make each division travel only $4\frac{1}{2}$ miles in succession. Were this distance divided into six stages, the load might be proportionally increased, with less fatigue to the horses; for it will invariably be found, that the most profitable mode of applying the labour of horses is to vary their muscular action, and revive its tone by short and frequent intervals of repose.—*Quart. Journ. Agric.*

The new Stone-breaking Machine consists of a rotatory steam-engine attached to a machine similar to a bone-mill, but considerably stronger, which breaks the stones to cover the road at the astonishing rate of 70 or 80 tons in ten hours. The engine is mounted on wheels, so that it can be removed to any part of the road without being taken to pieces.—*Newton's Journal.*

Traps for catching Larks.—The fowlers in our neighbourhood have commenced taking larks with nets and a device glass of simple construction. The birds are of the kind known as hill or flight larks. A small bridge, covered with a piece of glass, is by means of a draw-string made to revolve rapidly on a pivot, the rays of a rising sun falling on the glass. Such is the strange infatuation of the birds, that, however distant, they immediately fly towards it, and are either taken by clap-nets or shot. —*Brighton Herald.*

Beet-Root Sugar.—It is well known that, during the latter years of the late war, in consequence of the French colonies having been captured by Great Britain, sugar was manufactured in considerable quantities in France, from beet-root; indeed, nearly the whole consumption was obtained from this source. During the war the manufacturers flourished, but as soon as the peace of 1816 took place, and caused the sudden introduction of West Indian sugar through Holland, they were ruined by the comparatively low price at which the foreign sugars were introduced, in consequence of the necessity which the government felt of relaxing its rigorous decrees against foreign commerce. As, however, the price of foreign sugar rose again after the peace of Europe was established, several of the old beet-root sugar manufactories of France were re-opened, and profitably worked, as the supply of the French colonies was not adequate to the increasing consumption; and the duty upon the foreign growth being about $3\frac{1}{2}d.$ per pound, whilst the sugar made in the French colonies was also charged with a duty of about $1\frac{1}{2}d.$ per pound. The manufactories are daily increasing, and it seems probable that the consumption of sugar on the Continent will be soon entirely confined to that obtained from beet-root. One manufactory at Arras furnished, 1827, one hundred thousand kilogrammes of this article; and beet-root sugar seems likely soon to exercise some influence over the commerce of Europe. The consumption of sugar in France is estimated at about eighty millions of kilogrammes annually; and, if the home manufactory continues to receive as much encouragement as it has hitherto done, France will shortly grow upon her own soil most of the sugar she consumes. In this country, the beet-root may be procured as

cheap as in France; and as the cost of fuel for the manufacture would be much less, it would seem to be a profitable article of cultivation to the agriculturist, particularly as the sugar imported from the British West Indian colonies pays a duty of nearly *3d.* per pound. After the juice has been extracted, the pulp is used for feeding cattle, for which it makes a good winter food. On the Continent, the farmers mix a small quantity of flax seed-cake with the root, to make it more nourishing.

The manufacture of beet-root sugar is now perfectly established in France. In the departments of the Soame and of the Pas de Calais alone, there are above twenty establishments on a large scale making sugar. The cultivation of beet-root by the small proprietors of land for sale, to the sugar-makers, is a regular and common branch of husbandry; and, in those departments, if we are not misinformed, sugar is not only made on the large scale by the manufacturers, but by the house-wife of the farm-house, as a matter of domestic economy, requiring not more skill or trouble than cheese-making or brewing. In France, raw or Muscovado sugar is not so generally used in that state as in this country. It is more or less refined before it comes into domestic use.

The beet-root sugar-makers on the large scale refine their sugars, therefore, and produce sugar which, for whiteness and beauty, is unequalled by the refined sugar we produce from West India raw or Muscovado sugar. Bulk for bulk, however, the refined West India sugar is sweeter than the refined beet-root sugar; but, weight for weight, they are equally sweet. A lump of refined beet-root sugar of the first quality is lighter than a lump of equal dimensions of refined West India Sugar, probably because it is more pure and free from extraneous matter; but a pound weight of beet-root sugar differs from a pound weight of West India sugar only in our receiving more of these lumps in our pound weight. If sugar were sold by the cubic inch, beet-root sugar, as compared with West India sugar, would be less sweet and less economical in use; but, being sold by the pound weight, it is, for domestic use, even more economical.

From five to seven per cent. of raw or Muscovado sugar appears to be the usual produce from a given weight of beet-roots. From a given weight of this raw sugar, forty per cent. of the finest white refined sugar, with fifteen per cent. of inferior refined sugar, appear to be the quantities produced; making about two pounds and four-fifths of a pound weight of the finest white refined sugar from each hundred pounds weight of raw beet-roots. The pulp from which the juice is extracted, and the other residue of the manufacture, are used for feeding cattle, and form a very important item in the returns or profit. According to M. Chaptal, the value of the molasses, pulp, &c. is sufficient to cover one-fourth of the expense of the manufacture. This value must of course depend upon the value of butcher-meat and upon other local circumstances, which are at least as favourable in Great Britain as in France to the manufacture. It is not the least promising feature of the manufacture, in the eyes of those who promise themselves great and extraordinary results from it ultimately, that it is thus linked with the ordinary business of husbandry,—that it offers no excessive rate of profit, —that it operates upon a known root cultivated for feeding cattle,—and that the farmer, whether he raises beet-root for feeding cattle, or for sale to the sugar-baker, is cultivating a green crop, which, in his ordinary rotation of crops, he would at any rate raise on a part of his farm. The beet-root, it may be proper to observe, is the same plant which is

cultivated in England under the name of mangel wurzel. There are varieties of the plant having red, yellow, and white roots, but which appear not to be distinct varieties, as occasionally they re-produce each other. The white beet, having firm white brittle roots, is considered the most productive of sugar.—*Quart. Journ. Agric.*

The Common Fowl and Pheasant.—In the autumn of 1826, a wanderer of the pheasant tribe made his appearance in a small valley of the Grampians, the first of his family who had ventured so far north in that particular district. For some time he was only occasionally observed, and the actual presence of this *rara avis* was disputed by many; wintery wants, however, brought him more frequently into notice; and, in due season, proofs still more unequivocal became rife. When the chicken broods came forth, and began to assume a shape and form, no small admiration was excited by certain stately, long-tailed, game-looking birds, standing forth amongst them, and continuing to grow in size and beauty, until all doubts of the stranger's interference with the rights of *chanticleer* effectually vanished. These hybrids partake largely of the pheasant character; and as they are of a goodly size and hardy constitution, a useful and agreeable variety for our poultry yards may be secured in a very simple and economical manner.—A. F.—*Ibid.*

The Chinese Drill.—In the few authentic accounts we possess of Chinese husbandry it does not occur that any notice has been yet recorded of a machine extremely similar to our drill-barrow, which that extraordinary people would seem to possess. Timbowtki, a Russian officer, who conducted a mission to and from Peking in 1821, on their return, a few days after leaving Peking, states as follows:—"We saw some Chinese at work in the fields. Their usual plough, which resembles ours (Russian), is drawn by two oxen; then they employ a sowing machine, which has a great resemblance to the plough, and has three *hollow teeth*, with iron supports; above the wheels *there is a box*, from the bottom of which the seed falls through the teeth, which are about an arsheen (twenty-eight inches) in length constantly following the motion of the plough in the furrows. Behind is a small wooden roller, which covers the seed which has been sown, and supplies the place of a barrow. This plough is so light that it may be lifted with one hand. If the harvest in China produces fifty, seventy, and even a hundred fold, the cause will be found in the care with which they manure the ground, and the custom of sowing early, of weeding and watering: besides, the furrows are from seven to fourteen inches distant from each other, which gives the corn sufficient room to grow freely."—*Narrative of a Mission to Peking.*

Nature of Earths with reference to the Growth of Plants.—The Report of MM. Thenard and Sylvester, on a memoir upon this subject by M. J. St. Hilaire, is to the following purport. The author remarks that most persons who have analyzed arable earths, have taken exclusively such as had been cultivated, and in which the original constitution had been more or less altered. He believes that the various kinds of earths in their first state have peculiar powers, of nourishing particular plants; and thinks that the exact knowledge of these peculiarities would enable cultivators to put those seeds in the ground which are most suited to it. From various analyses, he draws the following inferences:—1st, That all earths are composed of silica, alumine, lime, magnesia, &c. in different proportions, together with a vegeto-animal matter, which is

more abundant as the earth is more fitted for the nourishment of plants; 2dly, That plants placed in earths, of which the constituent parts have an analogy with the particular nature of the plants, do not exhaust the soil; 3dly, That a series of observations on the different species, genera, and families, which grow naturally and in great numbers, perpetuating themselves on certain soils, with the analyses of these soils, would be of great utility in agriculture. The reporters think that agriculture would draw from such labours general inductions, rather than positive directions, but still that these would possess great interest.—*Revue Encyclopedique.*

Farinaceous Aliment obtained from Straw.—The attention of agriculturists in France has been recently directed to the discovery of a method of converting straw into a kind of bran, or *farine*, for the feeding of domestic animals. This discovery has been claimed by two individuals: the first is a miller near Dijon, of whose name we are not informed, who, it is said, on trying the millstone of a new mill, discovered the possibility of converting straw into nourishing food; the second is M. Joseph Maitre, founder of the fine agricultural establishment of Vilotte, near Chatillon. This distinguished acriculturist, known for the purity and perfection of his breeds of sheep, conceived the idea of converting into *farine*, not only the straw of wheat and other grains, but of hay, trefoil, lucern, sainfoin, &c. His efforts are said to have been perfectly successful, and his discovery arrived at, not by chance, but by long experiment and research. The aliment which he has produced, is said to be a complete substitute for bran. It is given to sheep and lambs, who consume it with avidity, and may be given to all other graminivorous animals as a grateful and substantial food. M. Maitre, with the view of bringing the process to perfection, has ordered a mill for its manufacture, to be erected in the midst of his large farms; and he is preparing to communicate a report to the Royal Society of Agriculture, on the advantages in rural and domestic economy to be derived from this preparation. We are not, at the present moment, informed of the nature of this process. If it be a simple grinding of the straw, or fodder, and a separation of some of its fibrous matter, we can easily imagine the advantages that may result from it. We know in this country, that the mere chopping of straw adds greatly to its nutritive powers, by facilitating mastication and digestion. We may believe that a more perfect comminution of its parts, will produce a corresponding effect, and extend very widely the uses of straw and other fodder, as a means of feeding our domestic animals.—*Quart. Journ. Agric.*

Planting and Pruning Forest Trees.—It is a national disgrace to see so many tens of thousands of English acres unplanted, and yet scarcely capable of maintaining two rabbits per acre; the whole of which, if planted with judgment, that is, all resinous trees on the highest grounds, hard-wooded trees on the best ground, and soft-wooded trees on the boggy ground, would afford a handsome remuneration. Trenching such land is not only of no use, but is really hurtful, where there are only a few inches of poor soil on rock, gravel, or grey sand, as void of nurture as the congealed lava from Mount Etna or Vesuvius; yet even such will grow many of the pine and fir tribes of trees better, in three inches of soil, than if planted in rich loam. As the trees grow, the soil will increase, and be fit for a crop of oaks, &c., by the time that the pines or firs are properly thinned out for timber trees. Suppose an acre of such land is bought for £10., and planted for £5., by contract, with larch fir,

Scotch pine, birch, and mountain ash, in equal proportions; in the course of fifteen years, such trees will every one be from 15 to 30 feet high; and, if they have been *well pruned*, they will be still higher and more valuable. To prune a tree *well*, is to prune it while it is young; say at 6 feet high, it should be pruned 2 feet up the stem. This is done in one minute, or less, with a good Sheffield knife (Barns, maker). The trees should be gone over in this manner every two years, say six times, or six minutes for each tree, equal to one farthing! By this early pruning, there is no occasion for thinning out any trees till they are fit for *something*. The Scotch pine are thinned out first for rails, &c.; the best of the larch are left as timber trees; the birch, mountain ash, &c., are cut periodically for crate rods, &c. &c.; and oaks, &c., are introduced into all vacant places.—*Gardener's Mag.*

Sweet Maize or Sweet Corn.—In a letter from Philadelphia, to Mr. Loudon.—I send you also two ears of Indian corn, of the kind called "sweet corn," from its superior sweetness to all the other varieties of that inestimable grain, the *magnum Dei donum* to the United States, and to all climates in which it will ripen. I do not know whether this variety is the same as that cultivated by Mr. Cobbett. Although the grains appear shrivelled when dry, they are plump when ripe, and brilliantly white. In this climate (Pennsylvania), if planted about the 10th of May, the corn will be fit to eat in the middle of July; in the southern states at an earlier date. The proper state in which to eat it is when the milk flows or spurts out thick, upon pressing the grains with the thumb nail. The best way to enjoy it, is to boil the ears with the husks on, and, when brought to table, to cover the ears with butter, adding a little salt, and to eat the grains off the cob. Over-refined people think this is a vulgar mode, and shave off the grains from the cob; but in so doing they lose much of their sweetness. This variety of Indian corn was found by the officers attached to the army or expedition of General Sullivan, in the year 1779, which was sent against the Indians, in the Gennessee country, and brought to Connecticut, whence it has proceeded south. The "nubbins," when about the size of the middle finger, are sometimes pickled in vinegar, and constitute an ornamental article, and pleasant condiment. Other varieties of corn are used in the same way. I also send an ear of blood-red corn, called "chicken corn," and a large variegated ear. We have also different kinds of yellow corn.—*Gardener's Mag.*

A Subscription Park and Warren for Field Sports.—The *Drapeau Blanc* gives notice of an association of a new kind, for the purpose of enabling persons of all ranks to enjoy the pleasure of the chase. A park of great extent is, it is said, taken on lease at no great distance from Paris; its extent is above 6,000 acres, partly arable, and partly forest ground. The plan is, to open it to subscribers during six months, viz. from September 1, to March 1, an ample stock of game being secured in preserves. Part of the shares are, it is said, already bought up, and the purchase of the remainder is recommended to all *amateurs* of sporting, as bringing within the reach of almost every class an amusement hitherto confined to men of fortune.—*Scotsman.*

Agricultural and Horticultural Society of New South Wales.—In the address for 1829, by its president, Sir John Jamieson, the account given of the state and progress of agriculture in the colony is highly favourable. It appears, from this address, that the culture of the tobacco plant has answered every expectation: 30 tons of it, as much or more

than all the settlers have grown in any former year, have been produced by five estates alone. There is, therefore, a prospect that, in a few years, shiploads of the leaf may be despatched to England for manufacture, provided the British markets afford a remunerating price. A skilful planter is reviving the growth of the sugar-cane on the river Manning. The growth of the opium poppy is more exuberant than in many other countries; and the quality of the opium made from it invites its more general cultivation. It is but a few years since the olive tree was introduced in the colony; and the rapidity of its growth, together with its excessive fruitfulness, shows that the soil and climate are particularly favourable to it. Every year's experience tends to the belief that the vine will one day become an important plant in the colony. The variety of the European grapes, and the perfection which they attain, hold out a promise that wine will hereafter become the most important export of Australia. Had the settlers been brought up in climates where the vine and olive are cultivated, wine and oil would long ago have been among the exports of the colony. But the British population had directed their attention chiefly to their native agricultural pursuits, and hence the delay of other productions more congenial to the soil and climate, and of greater importance to the trade of the colony. It does not appear that the attention of the British settlers has been yet sufficiently diverted from those pursuits, so that the Society's exertions will most probably be directed to those purposes which the circumstances of soil and climate render more particularly recommendable.—*Morning Chronicle.*

Diseases of Poultry.—From a series of observations made on the diseases of domestic poultry, Mr. Flourens makes the following conclusions:—1. In these animals, cold exercises a constant and determinate action on the lungs. 2. The effect of this action is the more rapid and more severe, the younger the animal is. 3. When cold does not cause acute and speedily fatal inflammation of the lungs, it produces a chronic inflammation, which is pulmonary consumption itself. 4. Heat always prevents the attack of pulmonary consumption: When the latter has taken place, heat suspends its progress, and even sometimes arrests it entirely, and effects a complete cure. 5. Pulmonary consumption is never, in any stage, contagious: Fowls affected with that disease were not only all day along with the healthy fowls, but at night roosted in the same places, without communicating their disease to them. 6. Lastly, the action of too long confined air exposes these animals to abscesses of the cornea, and inflammation of the ball of the eye. These abscesses and inflammations are also caused in a still more cruel manner, by cold, especially when accompanied with moisture.—*Annales des Sciences Naturelles.*

Cloth manufactured from the Wool of the Cotton Grasses.—Mr. Helliwell of Greenhurst Hey, near Todmorden, has manufactured a beautiful cotton russet cloth, and also yarn for stockings, from the wool produced by the cotton-grass plants found upon his estate there. This plant grows principally on the highest and most useless land in the kingdom, and consists of two kinds, the common or single-headed cotton-grass, *Eriophorum vaginatum*; and the narrow-leaved cotton-grass, or many-headed cotton-grass, *Eriophorum angustifolium*—both perennial plants, and from the latter of which the cloth and yarn were manufactured. It is supposed, that on many parts of Stansfield Common, near Todmorden, even in its uncultivated state, there might be from two to three hundred weight

produced upon an acre, and that the cost would not exceed 2*d*. to 3*d*. a pound. Specimens of the yarn and cloth have been sent to us, and the cloth is remarkably firm and beautiful. They may be seen at our office. —*Leeds Mercury*.

Mangold Wurzel—[erroneously spelled Mangel Wurtzel]:—Report of the Committee of the Doncaster Agricultural Association on the Advantages of Mangold Wurzel as a Fallow Crop. Founded on Returns received in Answer to the Queries issued by the Committee of London 1830. Pamph. 8vo, pp. 7.

"The advantages of mangold wurzel are these:—It is more sure to plant, being very little liable to the fly or grub; it will produce more weight; it is off the land earlier; it is useful as a change of fallow crop, when the land is tired of turnips; it will grow on land where turnips cannot be raised; it is better spring food. On the other hand, in favour of Swedish turnips, it may be said, that the weeding and singling out are less expensive; there is rather more time for fallowing in the spring; the succeeding crop is better than after mangold wurzel. Perhaps cattle feed best on Swedish turnips when they are used alone. It must, however, be remarked, that these last two evidences in favour of Swedish turnips are not fully proved, and only partially supported. In conclusion, perhaps two observations may be of use. First, That the very early season at which mangold wurzel should be sown, renders it highly expedient that the land should be made as clean as possible in the autumn, so that a few days in the spring may be sufficient to get it into a proper state for the reception of the seed. Secondly, That wet seasons do not suit mangold wurzel so well as dry; and, consequently, for the last two years, the Swedish turnips have been the more valuable crop of the two.

GARDENING.

Planting of Hardy Evergreens—By Mr. Macnab, Superintendent of the Royal Botanic Garden of Edinburgh.—Mr. Macnab says that he has planted evergreens at all seasons of the year, with more or less success, though from the middle of June to the middle of August, is the most unfavourable time for planting them. The particular seasons which he recommends, are late in autumn, or during winter, or very early in spring; that is, from the middle of October till the middle of February. And of this period, he recommends, as the best, from the middle of October till the middle of December, provided the weather and the ground be favourable; that is, provided there is no frost, no drying wind, nor much sunshine, and the ground is not too much saturated with wet, either from continued rain, or from the nature of the soil. Mr. Macnab also differs from others in the treatment of the plant, when putting it in the ground. Some recommend, when the plants have been long out of the ground, to be particular in drying their roots, by exposing them as much as possible to the sun and air, and not to be nice in planting. But the following are Mr. Macnab's views on this subject:—"One of the principal things to be attended to in planting evergreens," says he, "is to fix on a dull day for winter planting, and a

moist day for spring and autumn planting. There can be no secret in the proper treatment of evergreens. If there were, I should say, that it is in preventing their roots from becoming dry, when out of the earth; to choose moist and cloudy weather for planting; and still better, if we had the power, by foresight or otherwise, to secure a continuance of such weather some time after they have been planted. If the roots of evergreens be allowed to dry when out of the ground in spring, it is scarcely possible to prevent their suffering considerably, and showing this injury a long period after they are planted." And hence he recommends the winter months as being those in which we are best able to attain these purposes, the day being in general moist and cloudy, and even when it is sunshine, the sun being such a short time above the horizon, and its influence so trifling as to have little effect. But where that kind of weather cannot be obtained, he then recommends the work to be performed in the evening, after the sun gets low, particularly in spring or autumn planting. The following are his directions for the details of planting:—

"In planting evergreens," says he, "whether in a dull day, a wet day, or a dry day, it is very necessary to keep in view the expediency of keeping the plants for as short a time out of the ground as possible; if only a few minutes, so much the better; and, in all cases where it can be done, where great numbers are to be planted, we should, if possible, have some men stationed to take up the plants, others to carry them, and a third set to put them into the ground. In all seasons, situations, and soils, the plants should be well soaked with water, as soon as the earth is put about the roots." Though he recommends universally the practice of watering immediately after planting, he remarks that the urgency of the case is less where the evergreens are planted in winter, to form underwood in extensive plantations; and that the deaths, without watering, will be so few that they are not worth avoiding, where it costs much expense and trouble. "As soon as the plant has been put into its place," continues Mr. Macnab, "the earth should be filled in, leaving a sufficient hollow round the stem, and as far out as the roots extend, to hold water, which should then be poured in, in sufficient quantity to soak the ground down to the lowest part of the roots. In short, the whole should be made like a kind of puddle. By this practice, which is particularly necessary in spring and autumn planting, the earth is carried down by the water, and every crevice among the roots is filled. Care must always be taken to have as much earth above the roots of the plants as will prevent them from being exposed when the water has subsided." An old birch-broom, or any thing similar, he observes, ought to be laid above the roots, to break the fall of the water when it is poured upon them, the be shed b [illegible] adhere to them. This thorough watering is so indispensable, that it is to be applied even although it should be raining at the time of planting. After the water has been absorbed, the earth should be levelled round the stem of the plant, and as far out as the water has been put on, but not trodden. If the plants are large, a second watering is sometimes necessary; but, in ordinary-sized plants, one watering is quite sufficient; and, after remaining twenty-four hours, more or less, according to the nature of the soil, the earth about the stem, and over the roots, should be trodden as firm as possible, and, after treading, should be dressed with a rake.—*Quart. Journ. Agric.*

Preservation of Fruit-Trees from Hares.— According to M. Bus, young fruit-trees may be preserved from the bites of hares, by rubbing

them with fat, and especially hog's lard. Apple and pear trees thus protected, gave no signs of the attacks of these animals, though their footmarks were abundant on the snow around them..—*Bullet. Univers.*

To destroy Slugs.—I have always remarked that slugs will attack the leaf of a somewhat withered cabbage, in preference to those in a more thriving condition. When I plant out a bed of cabbages, therefore, I strew the leaves that I cut off all over the bed, and the slugs will lie under them, and feed on them in the shade. Every day or two I have the leaves gathered up and given to the pigs, and then strew more leaves; and so on, till I get rid of the slugs entirely.—*Cor. Gard. Mag.*

Currants.—The French are about to introduce into Corsica the culture of the raisin de Corinthe (currants,) for which purpose a thousand plants have been imported from the Morea. It is thought by the best horticulturists, that the climate of Corsica is well adapted to the growth of this excellent grape.—*Lit. Gaz.*

Horticultural Society.—Upon a recent examination of the Funds it appeared that a considerable number of Fellows were in arrear with their subscriptions, and upwards of twenty had not even paid their admission fees. The list included one king (George IV.,) for his subscription to the garden, 500 guineas; one duke, one marquess, thirteen earls or lords, seventeen honourables or sons of lords, and twelve clergymen. The amount of unpaid admission fees amounted to upwards of 100*l.*, and they were almost entirely due by honourables. In the list of commoners there was not a name of an obscure individual, of a nurseryman, or serving gardener: these were made to pay regularly.—*Gard. Mag.*

On the Normandy Cress.—By Mr. Charles M'Intosh. Author of the "Practical Horticulturist." It is now (Nov. 17.) rather late in the season to sow the seed for winter use, which is its greatest merit. A little of it may, however, be now sown very thin, which, if the winter prove mild, will come into use in February, March, and April. My season of sowing it is in September and October for winter and spring supply; and in March, April, and May for summer use. Indeed I sow no other sort of cress, and have from four sowings had a constant supply, besides seeds, for nearly two years; and our demand for salads is not small. To procure mustard to mix with it, I sow once or twice a week during the year; and such is the usual practice when the common cress only is grown. No season since I began to cultivate it (which is now fifteen years) has ever been so severe as to destroy it, or even to prevent it being gathered for a day. When it is frozen in winter we put it into a tub of cold water, which in a few minutes thaws it sufficiently. In cold situations it may be sown at the bottom of the wall; but this precaution is seldom necessary. It is not only a valuable salad herb, considered merely as such, but makes a much neater garnish, particularly for small dishes, than the finest curled parsley, and may be eaten by those to whom the taste of parsley is disagreeable. Wherein the medical properties of the one differs from the other I know not: but this I know, that I prefer the curled cress for a vegetable ingredient to breakfast before the other, as more palatable, setting aside the chance of being poisoned with water parsnip, or any other of the poisonous Umbelliferæ; or having my stomach made a sepulchre, or a breeding-place for frogs, insects, toads, lizards, and water leeches.—*Cor. Gar. Mag.*

A large Cucumber.—Length of the fruit, 26 in.; circumference, 12 in.; size of the leaf across the bottom, near the insertion of the leaf

on its footstalk, 16½ in.; across, farther up the middle, 17½ in.; from tip of the leaf to the extreme verge of either lower lobe, 18 in.—*Gard. Mag.*

Preservation of Potatoes from Frost.—In time of frost, the only precaution necessary is to keep the potatoes in a perfectly dark place for some days after the thaw has commenced. In America, where they are sometimes frozen as hard as stones, they rot if thawed in open day; but if thawed in darkness they lose very little of their natural odour and properties.—*Recueil Industriel.*

The Jardin des Plantes, at Paris, dates its origin from the beginning of the seventeenth century; but, as a school of botany and vegetable culture, was made what it is by the late Prof. Thouin, during the first years of the consulship. Speaking with reference only to what concerns plants and their culture, this garden is unquestionably the first establishment of the kind in Europe. We have in Britain several botanic gardens, but none maintained for the same objects as that of Paris. These objects are two: first, to collect useful or remarkable plants from every part of the world, and to distribute them to every part of France, and, as far as practicable, to every other country; and secondly, to form a perpetual school of botany and vegetable culture. Plants are brought to the Paris garden from all countries, by a universal correspondence, by particular naturalists sent out at the expense of the nation, and by the general protection and favour of government to the objects of science and the pursuits of scientific men. Objects of natural history destined for the Paris garden, in whatever description of vessels they may arrive in a French port, pay no entrance duty, and they are mostly forwarded by government conveyances to Paris free of expense. Every warlike, exploring, or commercial expedition is accompanied by naturalists officially appointed or voluntarily admitted, to whom every facility is afforded in the objects of their pursuit. Plants received in the Paris garden are propagated without loss of time, and distributed in the first place, to all the botanic gardens of France, of which there is at least one in the capital of every department; next, seeds or plants are sent to such of the colonies as it is supposed may profit most from them; and, lastly, they are sent to foreign correspondents, in proportion to similar favours received, or returns expected. The departmental botanic gardens propagate with all rapidity the plants received from the central garden, and distribute them among the eminent proprietors and cultivators of the department. This, at all events, is remarkably good in theory. Botany is taught by the lectures, demonstrations, and herborisations of a professor, and illustrated by an exemplification of 124 orders of the Jussieuean system in living plants. A considerable number of these plants are necessarily exotic, and kept under glass during winter; but, in May, before the demonstrations begin, they are brought out in the pots, and sunk in the earth in their proper places in the systematic arrangement, with their names and the names of the orders to which they belong placed beside them. The cultivation of vegetables, and all the different operations of agriculture and gardening, are taught by another professor, with assistants, and exemplified by different compartments in the garden. For instance, there is one compartment in which all the different operations on plants and on the soil are exemplified, from the different modes of preparing the soil for sowing or planting, through all the species and varieties of propagation, training, and pruning, even to hedge-growing and fence-making; another com-

partment contains all the plants of field culture; another all the medicinal plants; another all the principal timber trees; another, as far as practicable, all the fruit trees. Specimens of the different implements are kept in one building, and of the principal soils, manures, and composts in an appropriate enclosure; and so on. The essence of the lectures, accompanied by figures of such of the implements and operations as admit of representation by lines, will be found in *Thouin's Cours de Culture et de Naturalisation des Végétaux*, by Oscar Leclerc, 3 vols. 8vo., with one quarto volume of plates; and a complete description of the garden is given in the well known work of Royer.—*Gard. Mag.*

To destroy Vermin on Plants.—By a Correspondent of the *Gardener's' Mag.*—In all the recipes for destroying *Acari* which I have seen, sulphur is an ingredient; this, in its crude state, will not unite with the liquids used for that purpose, and therefore it can have little or no effect, except when applied as a wash on the heated flues of a house. In order to make it unite with soap suds, tobacco water, and other liquids usually made use of for destroying insects, it must be converted into a sulphuret, by boiling it with lime or an alkaline salt, as in the following mixture, which expeditiously and effectually destroys the red spider, by merely immersing the plant, or part infested, in the mixture:—Common soft soap half an ounce, sulphuret of lime * one ounce by measure (or two table spoonfuls), soft water (hot) one ale quart. The soap and sulphuret to be first well mixed with an iron or wooden spoon, in the same manner as a mixture of egg and oil is made for a salad; the hot water is then to be added by degrees, stirring the mixture well with a painter's brush, as in making a lather, by which means a uniform fluid will be obtained, like whey, without any sediment, which may be used as soon as it is cool enough to bear the hand in it. This mixture will destroy every insect usually found in the green-house, by mere immersion, except the *Coccus*, or scaly insect, which adheres so closely to the stem, or under side of the leaf, that the mixture cannot reach its vulnerable parts; therefore, in this case, the mixture must be applied with a brush that will dislodge the insect. If the mixture be put into a wooden bowl, or any other shallow vessel, small plants in pots, and the leaves and branches of larger ones, and of fruit trees, may be easily immersed in it by pressing them down with the hand. The above mixture will not destroy the black Aphides of the cherry tree, nor the green Aphides of the plum tree, by immersing the leaves and branches in it; there being an oiliness on these insects which prevents its adhering to them. It will destroy them by applying it with a brush: but this is too tedious a process. It has been recommended, by writers on horticulture, to wash these and other fruit trees against walls, before the leaves and buds appear, with mixtures which cannot be safely applied after; for which purpose the above mixture, with the addition of spirits of turpentine, is likely to succeed

* The sulphuret of lime is easily made in the following manner:—Take of flour of sulphur one ounce; fresh lime, finely sifted, two ounces; soft water a quart; boil the mixture in an iron vessel about a quarter of an hour, frequently stirring it after it begins to boil; let it stand to settle, and pour off the clear liquor. If it is not used on the same day, it must be put into a bottle filled with it, and be well corked; for, if it be exposed to the air, it will soon attract oxygen, and will then curdle the soap, and smear the plants with a white substance, which is not easily washed off.

as well as any other, or better: but I have not yet had an opportunity of giving it a trial. Half an ounce, by measure, of spirits of turpentine being first well mixed with the soap, and the sulphuret and water added as before; or the wash may be made stronger, by adding twice the quantity of each ingredient to the same quantity of water. For destroying slugs and worms there is no recipe so simple, attended with so little trouble, and, when properly applied, so effectual, as common lime-water. The plants on which the slugs are found must be watered with it twice at least, at an interval of three or four minutes. If you place three or four slugs on the ground, and pour lime-water on them from a watering pan, you will soon perceive them throwing off a kind of slough, and after that crawling away; but if you sprinkle them again with the lime-water, they will not be able to throw off another slough, and soon die after the second operation. When a person has therefore watered as many plants as takes up the time of three or four minutes, he must turn back to the place where he began, and water them again. Lime-water, for this purpose, may be easily made so as to be always ready. Into a trough, containing about fifty-five gallons of water, throw in two or three shovelfuls of lime, stir it up three or four times on that day, and the next day the liquor is clear and fit for use, and will continue to answer the purpose for some time, without adding any fresh lime, by stirring it up again before it is used, and letting it settle. If the lime-water be of sufficient strength, it will destroy the large grey snail with twice watering, and all worms that are out of the ground at the time of watering, and it will not injure the most tender plant when used in a clear state.

Flowers.—To obviate the bad effects of decayed flowers, perhaps the best plan of ornamental flower clumps, where expense is not regarded, would be to have them partly planted with evergreens of low growth, or kept low by pruning; and between these to transfer from the pots in which they had been raised, the finest flowers of each season just taken on the point of flowering, in sufficient masses of each colour, and to be removed and replaced with others as soon as they had done flowering, so as always to have a new and brilliant display at all periods of the year, and at the same time a due contrast of a more sober colour from the intermixed evergreens.—*Gardeners' Mag.*

Sweet-scented China Rose.—The following mode of propagation is easy and expeditious:—Put a plant or two into the hot-house in January or February, and there will soon be some young shoots: as soon as they have three or four leaves, take them off, no matter how tender or succulent, *but never remove or shorten a leaf.* Having prepared your cuttings, put them into sand, with a glass over them, in the same heat as the plants, and in three weeks they will be ready to be potted off. Thus continue taking fresh cuttings, or topping the cuttings already struck, till there are as many as you want. I propagated upwards of 100 plants in one season, from a small plant which only afforded three cuttings at the commencement.—*Ibid.*

Large Vine at Sellwood Park, Sunning Hill, Berkshire.—The large Black Hamburgh vine at this place was brought from Sion Hill gardens, then the Duke of Marlborough's, in 1810. It was then a small plant, which had been struck that season from an eye, and it was planted in Sellwood Park garden in 1811. For the first year or two nothing very remarkable was noticed in its growth, more than that it had a very healthy appearance. About the fourth or fifth year after planting, it had nearly

filled the small house it was in. The house was then lengthened 20 ft., and in about two years afterwards it had nearly supplied it with strong healthy bearing wood. The house was then again, and has been since lengthened. The present length of the house is about 90 ft., breadth 13 ft.; number of bunches on the vine 1,100; and it is intended to have the house lengthened 36 ft. more next autumn. To show the vigour of this remarkable young vine, it may be mentioned that, when three years ago the house was lengthened an additional 35 ft., the second year afterwards the shoots reached to the end of it. It is a remarkably good bearer, producing a fine large dark berry of an excellent flavour. Many of the bunches weigh upwards of 2 lbs.; some cut last year almost 2½ lbs. It stands nearly in the centre of the house. It has a beautiful straight stem, upwards of 6 ft. in height; and then branches off each way horizontally, with nine principal leading shoots. Its roots may be said to be both in and out of the house; as it is planted inside, but, the front wall being on arches, many of the roots are in the old asparagus beds in front.—*Gardeners' Mag.*

The Black Eagle Cherry.—As good a bearer as the Black Heart upon an open standard, and far superior to that variety in the quality of its fruit: it is not to be doubted that this will one day usurp the place of that ancient variety in our gardens. It was raised by Mr. Knight, from a seed of the Ambrée of Duhamel, impregnated with the pollen of the May Duke; and it really combines all that is most worth praising in both those varieties. Ripens soon after the May Duke.—*Pomological Magazine.*

Hughes's Golden Pippin Apple.—Very different from the old Golden Pippin, and in many respects inferior to that variety (as what is not?) this deserves to rank among the most useful and beautiful table-fruits of England. It is remarkable for the neatness of its appearance, its rich golden hue (in which it surpasses its rival), and for the great productiveness and perfect health of the trees. It bears most abundantly grafted upon the common English Paradise stock, which is the Doucin stock of the French, and perfectly different, both in appearance and in effect, from the real Paradise of Holland and France. —*Ibid.*

On keeping a fine Bloom on Cucumbers.—By Mr. Geo. Fulton, Gardener to Lord Northwick.—The art of producing and keeping a fine natural bloom on cucumbers, either for a gentleman's table, for show, or for the market, merits great attention, both as to the perfect appearance of the fruit, and also to the general culture of the plant after the fruit is set. From that time a strong bottom heat should be given with dung linings; or, if late in the spring, short grass laid round the frame on the dung will cause a very strong heat. Water ought then to be given plentifully, always at the back part of the frame; and at no time should the plants be watered over their leaves, when the fruit is wanted for its fine delicate bloom and long regular shape. A fine foliage over all the bed is also a very essential point; and leaves should never be picked off near the fruit (as too often done), as it thereby deranges the juices of the plant, and consequently the fruit does not swell off finely. Air also should be given very sparingly in the middle of the day, even in bright sunshine, and generally there should be a little left in the night, when the bottom heat is very strong, as by that means the air in the frame is kept sweet. When the fruit is fit to eat, for any of the above purposes, great care should be taken to pack it in narrow wooden boxes, in the

largest stinging nettle leaves that can be got, filling up the interstices with well-thrashed moss, and covering over with soft leaves of any kind. It may then be sent to a great distance with a fine bloom, and, upon the whole, in a perfect state.—*Gardeners' Mag.*

Macartney's Method of obtaining new Kinds of Potatoes from Seeds.—Sow the seed in a hot-bed, about the middle of February, in lines 6 in. apart, a quarter of an inch deep, and very thin. When water is necessary, sprinkle it between the lines, but avoid wetting the plants, as that would injure them. A little air must be given before they are watered. As the plants rise, rich earth, carefully put between the lines, will add fresh vigour to them; but the tops of the plants must not be covered by these mouldings, which should be occasionally repeated until they are fit for transplanting. To prepare them for this, about the end of April they must be plentifully refreshed with air; and, two hours before removing them, they must be plentifully watered *all over*, and the glasses covered with bass mats, to prevent the sun, if shining at the time, from scorching the plants. Take each plant up carefully, with a ball of earth attached to it, and plant them in trenches, as you would celery, only with this difference, the distance from plant to plant in the lines must be 18 in.; and if the sun should be shining out strong at the time of planting, a flower-pot should be placed over each, to prevent flagging; for, with all your care in taking up, a good many of the fibres will be broken. After the plants have established themselves, remove the pots, and earth up occasionally, as long as the space between them will admit of it. The produce of new kinds of potatoes raised in this manner is generally prodigious for twelve years afterwards. The best manure is yellow moss and rotten horse-dung.—*Ibid.*

Blossoms.—From the Trans. Caledonian Hort. Society.—Against the destruction of the blossom, which too often happens to our wall fruit in early spring, a covering through the night was recommended. The injury done at this period is produced, not by the cold of the night, but by the sudden action of the morning sun on parts previously reduced and enfeebled by cold; and the mischief may therefore be prevented either by raising the temperature of the plant before the sun shines upon it, or by intercepting his rays till the plant shall have acquired, through the medium of the atmosphere, a suitable degree of heat. In very unfavourable seasons, when the atmosphere is obscured, and the sun exerts but little force, no fruits can be expected to ripen in the open air, without the aid of walls heated by flues or by some other means. Even in better seasons they materially accelerate growth, and must ensure a more perfect maturation. Very fine Black Hamburgh grapes were this season ripened in the open air, by the aid of such walls, in the neighbourhood of Glasgow; and brought, in the market of that city, a price equal to those of the same sort grown in the hot-house.

An improved Method of planting and protecting Bulbs.—Having determined the place for the clump or patch, the earth is taken out to the depth of about 6 in.; and an earthenware rim, of the shape of a common garden pot cut into two at half its depth, is plunged about 1½ in. below the surface of the soil, the inside filled to the proper depth with good earth, and the bulbs planted, so that their tops may be about level with the top of the rim: by which means they can be taken up and planted at any season of the year, without much detriment to the plants, as the rim holds the ball of earth together.—*Gardeners' Mag.*

Maize, or Cobbett's Corn.—Mr. Greig, of Conduit Nursery, Bayswater, has contributed to the *Gardeners' Magazine*, a brief but valuable paper on the culture and produce of a patch of corn grown by himself, as above. "Having got the ground well dug early in May, on the 7th of that month I drew seven drills, 3 ft. apart, of the same depth as for kidneybeans, and planted the seed of two ears of corn, purchased of Mr. Cobbett, 6 in. from seed to seed, treading the rows, as my ground was very dry. In a week or ten days the corn came up, scarcely a seed missing; and, about a week after that, I gave it a good hoeing, which greatly improved it. A fortnight afterwards I gave it a second hoeing, and about the 20th of June a third hoeing, stirring the ground full 4 in. deep. Three days after this last hoeing I landed the corn up, and in the middle of August topped it, cutting off the male blossom. (*See Cut.*) I have now gathered it; and from the seven rows, each 38 ft. long, the produce is 1,156 good ears, and 339 defective ones, which, had it been a fine summer, would all have been good. I have rubbed out the corn of seventeen ears, not one of which was what I call a fine ear, and the produce is a quart of clear corn; therefore the 1,156 good ears produce 2 bushels and half a peck for 3½ rods of ground, or 102 bushels per acre. The defective ears, being only half ripe or very small, I do not include in my calculation."

"Mr. Cobbett having seen my crop just after the last hoeing, stated in his *Register* that it was the finest he had seen; but, not to overrate the produce, say that it takes eighteen ears to make one quart of corn: then there is 96 bushels per acre. The middle of April, if the weather be dry, will be the best time to plant; and I think 10 in. or 1 ft. apart, according to the goodness of the ground, will be better than 6 in. Those plants which had one sucker left, bore more ears than those that had no suckers. I had one plant with eleven ears, several with nine and ten, and a great many with seven and eight ears each."

The editor of the *Gardeners' Magazine* has illustrated the paper with a cut of one of the plants grown by himself, and one grown by Mr. Greig. Of the editor's plant the annexed cut is a copy. It is the average of a row of plants raised in his garden from what he calls the "large" variety; but which plants, though they had every advantage in point of culture, did not mature a single ear. The ears appear to have been but half the size of those grown in North America, and considerably less than that grown by Mr. Greig. For a fuller explanation we must refer the reader to the *Magazine*, No. xxiv. as well as for an experimental paper on the same subject, we believe by Mr. Charlwood, the respectable seedsman of Covent Garden. Appended to the latter is the following Note by the Editor:—

A gentleman from Sydney who has cultivated the Indian corn there for two years, informs us that the stems grew with him 11 and 12 ft. high, with only one ear at top: two ears on the same stem are quite a rarity at Sydney. The utmost produce that he obtained was 50 bushels an acre. It appears highly probable, therefore, that some of the dwarf varieties of maize would prove much more prolific in New South Wales than the tall varieties at present grown there. The hint may be worth the attention of those going to the Swan River. Probably the varieties would soon degenerate, but the seed could be renewed from Europe or North America. The grains of maize will retain their vegetative powers for at least six years, so that a stock of seed might be kept on hand. We ascertained the fact of this degree of durability of the vegetative powers of the seed of the maize from a lady who resides at Hampstead.

After observing all the different accounts of the crops of maize which have appeared in the newspapers, particularly in the *Farmers' Journal*, the *Country Times*, and in Cobbett's *Register*, in the course of this very unfavourable season (1829,) the conclusion we have come to is, that maize may be worth cultivating to a limited extent, for feeding poultry, on dry, warm, sandy soils, and in cottage-gardens, south of York. We do not like the bread or the pudding made from it, either alone or with wheat flour, and should be sorry to see it in general use as food for man. We do not think maize meal at all comparable with oatmeal; though that may be prejudice. But we know, from what we have seen in France and Germany, that the grain, entire or broken, is a rapid fattener of geese and other poultry; that the tops of the stalks and the leaves are greedily eaten by cattle; that, in Italy, the chaff is an excellent substitute for feathers in beds; that, the plant being cultivated in rows, and requiring frequent movement of the soil and to be kept very clear from weeds, it is a cleaning crop; and that, the grain having no gluten, it might probably alternate well with wheat. On dry, warm, sandy soils, such as at Sandy, in Bedfordshire, where Mr. Moore raised at the rate of 105 bushels per acre (*Farm. Journ.*, Nov. 9. 1829,) we believe it will be found a profitable crop.

Straw Protectors for preserving Fruit Trees from the Frost.—This straw protector consists of small handfuls, averaging not more than two or three dozen of straws each, tied together at the root end, and suspended from the wall, beginning at the bottom; so that the ears of one range of protectors will always overlap the root end of the other range, in the manner of thatch. This mode of protecting trees is a good deal in use both in France and Germany, and has the recommendation of being cheap.—*Gardeners' Mag.*

Prevention of the Mildew on Peach and Nectarine Trees.—The following preventive of the mildew on peach and nectarine trees has simplicity, as well as the experience of many years, to recommend it:—Take of sulphur and rain or river water, in proportions of two ounces of sulphur to every four gallons of water. Put the quantity which may be required into a copper or boiler, and let it (after it commences boiling) boil for half an hour; after which it may be taken out, or suffered to remain until it becomes of a tepid state, when it ought to be applied to the trees by means of the garden engine or syringe, as in a common washing with water. The time for applying it is annually, as soon as the fruit is set and considered out of danger.—*Ibid.*

To be able to draw Flowers botanically, and Fruit horticulturally, that

is, with the characteristics by which varieties and subvarieties are distinguished, is one of the most useful accomplishments of young ladies of leisure, living in the country. It is due to Mrs. Withers of Grove Terrace, Lisson Grove, to state that her talents for teaching these objects are of the highest order, as many of the plates in the "Transactions of the Horticultural Society" and the "Pomological Magazine" abundantly show. We have observed, with no small pride and pleasure, that several of our principal nurserymen, not only about London, but in the country, have brought, or are bringing, forward their daughters, so as to be competent to make scientific portraits, not only of fruits and flowers, but of trees and shrubs, in their different stages of growth. When once a system of education is formed which shall embrace all modern improvements, and when that system shall be universally applied, the drawing and making portraits of all, or of any objects whatever, will be as general an accomplishment as penmanship is now. To all the mechanical trades drawing is perhaps of more use than either writing or arithmetic. It is of immense use to a gardener; and we hope no young reader will neglect its acquirement.—*Gardeners' Mag.*

Drawing from Nature.—Young Gardeners may accustom themselves to draw from nature, by coating the surface of a pane of glass with a solution of gum arabic, and letting it become dry. They may then with one hand hold the pane between their eye and the objects to be copied, and with a nail in the other trace the outline of the object on the gummed surface. Glass prepared in this way with gum, gelatine, or bone glue, has of late years been procured by English artists from France.—*Gill's Repository.*

To destroy the Caterpillar.—A person has tried successfully, for a number of years, "2 oz. of white hellebore dissolved (infused) in three gallons of water."—*Gardeners' Mag.*

Composition for destroying and guarding against Insects on Wall Trees.—Take sulphur vivum, slaked lime sifted fine, and Scotch snuff, of each an equal quantity, of lampblack half the quantity, and let them be well blended: add to them soap suds and urine, until it gets the consistence of thick paint. Before you prune your trees, let them be all unnailed from the wall; and after pruning, let the composition be laid on the trees with a painter's brush carefully; paint every pore of the branches and buds with it. It has great effect on the bloom, and invigorates the trees. If any of the composition be left for a future occasion, it should be kept in a tub, or other vessel, and urine poured on it, so as to cover the surface.—*Ibid.*

Potatoes.—The following list will show a succession of good potatoes for the year, without artificial means:—

May, June, and July	Ash-leaved, red, and other kidneys.	
July and August -	Purple eyes; a fine, large, round, mealy potato.	
September, October, and November -	Prussian; a red mealy potato, an excellent bearer.	
November, Decemb. and January -	Devonshire apple, Prince's beauties	All good.
Feb. March, April, and May - -	Red colliers and white long-keepers	All good.

Mr. J. Elles, late gardener at Longleat.—*Gardeners' Mag.*

Transmitting-heat Wall.—The Rev. J. A. H. Grubbe of Stanton St. Bernard, Wiltshire, has taken out a patent for a wall so named. The intention is to erect thin partitions in gardens as substitutes for walls, against which fruit trees may be trained, and through which the warmth of the sun may, by reason of their thinness, be transmitted, which will greatly promote the ripening of the fruit, and improve its flavour. The material proposed to be employed for constructing these walls or partitions, is slate of the ordinary quality, in slabs of the kind usually applied to the roofing of houses. Iron frames are proposed to be prepared for the reception of the slates, like the frames of windows [with holes in both sides for inserting wires to serve as a trellis], and the slates being cut to proper shapes and dimensions, may be secured in the rebates of the frame, by putty, in the same way as glass. These frames are to be from 6 to 8 ft. wide, and of a suitable height, and may be joined together side by side, by rebates or flenges, and held fast by screws, bolts, pins, or staples, or in any way that may be found desirable to secure them firmly. Temporary blocks of stone may be placed along the ground to support the partitions, with cross pieces to receive standards or slight buttresses, to keep the wall or partition perpendicular; and against the face of the wall trellis-work of wood, or other fit material, may be placed, for the support of the branches of the trees. Walls or partitions for gardens formed in this way will transmit the heat of the sun through them; and hence fruit, which may be growing against these walls having a northern aspect, will receive the benefit of the sun's warmth, transmitted through the slates. In the construction of these transmitting walls, the patentee does not confine himself to slate, but considers that plates of iron, applied in the same way, might answer the purpose nearly as well, provided that their services were blackened, which would cause them to absorb more of the solar rays. Even frames of glass might answer the purpose, applied in the same manner, and perhaps some other materials might do; but it is desirable that the frames should be light enough to admit of their being removed without difficulty, in order that these partitions may be shifted from place to place [put under cover during winter], and set up in different parts of the garden, as convenience may dictate.—*Newton's Journal.*

Packing Fruit Trees for Exportation.—As soon as the tree is taken out of the ground, the roots are dipped in a thick mixture of earth and water. The roots are then tied in bundles, and dipped in all at once, and a mat is lapped over them, to keep the earth round them together. They are afterwards placed in a box, and a piece of wood is fixed across the box, over the top part of the roots, to prevent them from moving, as the branches are not lapped up at all. Trees packed in this manner, have remained in the above condition four months; and, when unpacked, the roots were throwing out new fibres. This occurred last spring; and, although the season was so unfavourable, the trees made exceedingly fine strong shoots. The plan adopted by Messrs. Buel and Wilson, of the Albany nursery, in packing their fruit trees, is as follows: They dip the roots well in a mixture of earth and water; but instead of lapping the roots in a mat, they lay them in the end of the box, and fill in between them with wet moss; so that the lid of the box presses against the moss and thus prevents the roots from being shaken.

The Weeping Ash of Wilson's Nursery at Derby, of large dimensions, and nearly half a century old, has been purchased by the Duke of Devonshire, and removed to a conspicuous situation at Chatsworth. The

tree was removed on a machine similar to that used by Sir H. Steuart, constructed by Messrs. Strutt of Belper, and under the direction of Mr. Paxton, the duke's head gardener. The weight of the tree was estimated at from 7 to 8 tons, and the distance to which it was conveyed is 28 miles. We are not informed whether the roots were previously prepared by cutting; but, from the subject not being mentioned in the very long account of the operation given in the *Derby and Chesterfield Reporter*, April 15th, we should conclude not.—*Gardeners' Mag.*

Large Melon.—A Cantaloup melon has been raised by Edward King, gardener to John Buckle, Esq., of the Wildlands, near Chepstow, measuring 34½ in. circumference, and weighing 15 lb. 2 oz.

Destroying Slugs.—Mr. Gorrie discovered by accident that not only are slugs destroyed by the urine of black cattle, or the drainings of a cow-house or dunghills, if poured on them, but the approach of others to the ground so moistened prevented for a considerable time. The drainings of the cow-house may be diluted with about one third of water.—*Mem. Caledon. Hort. Soc.*

A Single Melon Plant, in the garden of Mrs. Punno, Taplow Lodge, produced two fruit, the largest of which weighed 24¼ lbs., and the other 22 lbs., and what is rather singular, they both grew upon one vine.

A simple and effectual Method of killing Wasps.—When a wasp's nest is found, I take about half a pint of tar in a pitch-ladle, and run part of it in the hole where the nest is; put the remainder of the tar round about the mouth of the hole, and the job is done. All the wasps that are in the nest are caught in their attempt to come out, and those that are out are caught in their attempt to go in; so that none escape. If the nest should be in a place where the tar will soon get dry, it may, perhaps, be better to put a little more tar round the hole the following day: as in general, there are a great many of the wasps which are out all night, and when the tar is dry it will not catch them.

Cheap and easy Method of raising Celery.—As almost every person who has a garden plants a few early potatoes, those who are fond of celery will find the following method of raising it cheap, simple, and easy.

After the potatoes are fully hoed up, it will be found that the furrows are an excellent ready made trench for the celery; then take a small spade, and cover in a good dose of strong manure betwixt every alternate row of the potatoes, every furrow would be too close, and then plant in the usual manner. In digging the potatoes, take up every alternate row first, which will give more air to the celery.

The advantages of the above plan are as follow:—1st, no ground is lost by the celery crop; 2nd, no labour is required in making the trench; 3rd, the celery plants thrive better at first by being partly shaded by the potatoes; and 4th, the celery can be partly earthed up when digging the potatoes, without any additional labour.

I may also observe that every economical gardener may also take a crop of early cabbage from the other furrows, as every alternate furrow is only occupied with the celery; the other furrows may be planted with spring-sown cabbage plants, which will be quite ready for cutting before the earth is wanted for the celery. I remark farther that celery plants raised in the open air are by far the best, and just as easily raised as green kail or cabbage, notwithstanding the mystifications of some of the professional gardeners.—*Gardeners' Mag.*

Peas.—The following was the practice of gardeners in Scotland forty years ago, particularly the never-failing method followed by the late Mr. Thomas Thomson at Tynningham, the seat of the Earl of Haddington:

About the 10th of November, provide as many clean 24-sized pots as may be necessary; fill them with light rich compost; divide the pots by a diametrically placed piece of broken glass, slate, tile, or any thin bits of pales cut to length, thrust down into the mould: draw, with the two fore and middle fingers united, shallow drills on each side the partitions. In these sow the seed (the earliest sort) moderately thick; cover with the compost; plunge the pots in a cold frame, in an open spot, and protect them from mice and frost; giving air on all seasonable occasions throughout the winter. As soon as the rigours of winter are over, they may be transplanted; if under a south wall the better. Dig a spit along and close to the wall; cut out a shallow trench within 5 in. from it; turn out the contents of each pot into or upon the hand; withdraw the partition, and separate the roots of the divisions which will be found united at bottom with a knife; then place the divisions along the trench, earth up, and make all smooth. Stick them immediately with light slender sticks previously prepared, and about 2 ft. high. This will not only defend them from the boisterous equinoctial gales which happen about that time (middle of March) but also from frost. The peas are fit to gather about the 1st of May, according as the spring is more or less genial.—*Gardeners' Mag.*

Remedy for Blight.—A decoction of feverfew and elderberry flowers, applied to the black blight on peach and cherry trees, will effectually destroy the insects and recover the trees.—*Ibid.*

Fruit-trees in Churchyards.—N. Phillipe Bosquet, who died at Amsterdam on the 8th of January last, bequeathed two thousand florins to the Benevolent Society of the Northern Provinces of the Netherlands, on the condition that "two fruit-trees of full growth shall be planted over his grave, the fruit to be publicly sold by auction every year, in order to prove that the receptacles of the dead may be rendered useful and beneficial to the living. The directions of the testator, say the papers, have been complied with.—*Scotsman.*

Identity of the Peach and the Nectarine.—In the *Linnean Correspondence* it is stated (preface p. 1.) that a tree bought for a nectarine produced peaches; the next year it bore nectarines and peaches, and for twenty years after P. Collinson informs Linnæus (p. 7.) that at Lord Wilmington's a tree produced both nectarines and peaches. Sir J. E. Smith, the editor, says, that several instances of this have occurred; and that he was presented with a fruit half nectarine half peach. It grew on a tree which usually bore nectarines and peaches; but in two seasons, at some years' distance from each other, the same tree produced half a dozen of these combined fruits. Collinson mentions (p. 70.) that he saw both fruits on the same tree close to each other; and (p. 75.) that a peach produced a nectarine from a stone, and not a peach in his own garden. Without knowing the foregoing facts, Professor Chapman informed me that formerly, in Virginia, peach trees lived a number of years, and that when they were very old, he had often seen them bear nectarines. The fact is well known, he says, to all old natives of Virginia.—*J. M. Philadelphia.*

Large Cucumber.—A cucumber (the Bloor's White Spine) was cut on the 8th of June, in the garden of W. Hardman, Esq., of Chamber Hall, near Bury, of the following dimensions: Length 26 in., girth 11. in.; weight 5 lb. 8¾ oz. It did not appear overgrown, but in a proper state for the table.—*Morning Chronicle.*

DOMESTIC ECONOMY.

Potatoes are a very fit esculent to lower the food of the opulent, and to diminish their consumption of richer viands; but as the sole support of the poor as a substitute for bread, they are totally inadequate. Man cannot live upon them long, in health and strength, whatever may be said of the Irish. Bread replenishes the system of itself, unaided by flesh meats; whilst the potato provokes and nurses a desire of ardent spirits, and places the individual so miserably fed in the situation of a traveller, who, his fare being coarser than usual, finds consolation in extending the indulgence of strong potations. Poor nourishment may drive a whole people into habits of drunkenness, into which, with better fare, few, comparatively, would be led; thus we may soon see the hitherto steady, industrious, joyous English people, changed into a nation of miserable turbulent drunkards.—*Times.*

Chestnuts at the corners of every street in Florence, can be had in seven different forms: raw; cooked and hot, both roasted and boiled; dried by heat (the skins being taken off), in which state they have a much sweeter and superior flavour: and made into bread, a sort of stiff pudding, and into thin cakes like pancakes. This valuable fruit constitutes a considerable portion of the food of the lower classes, who must daily consume in Florence some tons. From the low price of chestnuts in Italy (5 quattrini for about a pint), there can be little doubt that they might be imported into England (at a lower duty), and afforded at a much cheaper rate than they are usually sold there, and so as to become one of those innocent luxuries of the poor which every political econonomist would desire to see Italy enabled to exchange for our hardware and cottons, if the custom were introduced in London and other towns, of roasting them on small beat iron stoves, heated by coke or charcoal, at all the green-shops and gingerbread-dealers, so as to tempt passengers with them, "piping hot," as is the case in Italy, in every street; where, in cold weather, the labourer or schoolboy, in buying a pint of chestnuts, stores up in his pocket a stock of *portable caloric*, which warms his fingers, while he at the same time both gratifies his palate, and appeases his hunger.—*W. S. Florence, Jan. 2,* 1830.—*Gardeners' Mag.*

Brewing Beer from Mangold Wurzel.—Mr. Reuben Earnshaw, of Kirkburton, near Barnsley, lately made an experiment by brewing the roots of the mangold wurzel. He says, that when the roots are sliced and drained through a sieve, and treated by a process the same as in ordinary brewing, adding two pounds of treacle to a bushel of the roots, they will produce as much good liquor with a quartern of hops, as four pecks of malt.—*Scotsman.*

Spirit from the Berries of the Mountain Ash.—The berries, when perfectly ripe, are first exposed to the action of cold in the open air, then put into a wooden vessel, bruised, and boiling water poured on, the whole being stirred until it has sunk in temperature to 82 deg. Fahr. A proper quantity of yeast is then added, the whole covered up, and left to ferment. When the fermentation is over, the liquor is to be put into the still, and drawn over in the usual way. The first running is weak and disagreeable in flavour; but being distilled from off very fresh finely powdered charcoal, in the proportion of 8 or 9 lbs. to 40 gallons of weak spirit, a very fine product is obtained. The charcoal should remain in the liquid two or three days before the second distillation.—*Brande.*

To Restore Wine which is becoming Sour.—Take dry walnuts, in the proportion of one to every gallon of wine, and burn them over a charcoal fire; when they are well lighted throw them into the wine, and bung up; in 48 hours the acidity will have been corrected.—*Journal des Connaissances Usuelles.*

Artificial Port Wine.—The Russians make their port wine thus—Cider 3 quarts, French brandy 1 quart, gum kino 1 dram. And the French restaurateurs imitate successfully old hock by the following mixture:—Cider 3 quarts, French brandy 1 quart, alcoholized nitric ether 1 dram.

Brandy (and probably Spirit of any Kind) is found an antidote to beer, and it has been proved by medical men in France, that a man intoxicated by drinking the latter will be rendered immediately sober by a glass or two of the former. Intoxication by either wine or spirits is counteracted by vinegar. Hence Lord Byron preferred a glass of port and a glass of claret alternately to either alone.

Butter made from the Milk of a Cow fed with Turnips has always a very bitter disagreeable taste, not worth by 2*d.* or 3*d.* per pound so much as from any other feeding. This taste, it is well known, may be prevented by pouring boiling-hot water into the churn before churning.

Coffee.—From experiments made chiefly by Cadet (*Ann. de Chimie* lviii. 226.,) it appears that coffee contains an aromatic principle, a little oil, gallic acid, mucilage, extractive, and bitter principle. The result of Cadet's experiments on sixty-four parts of coffee was as follows:—

Gum	8.0	Albumen	0.14
Resin	1.0	Fibrous and insoluble matter	45.05
Extract and bitter principle	1.0		
Gallic acid	3.05	Loss	6.86.

As a general palliative, strong coffee is often serviceable in various kinds of headache; and where its own sedative power is unavailing, it forms one of the best vehicles for the administration of laudanum. It diminishes in some degree the hypnotic power of the latter, but counteracts its distressing secondary effects. When laudanum is intermixed with strong coffee for the cure of many modifications of headache, tranquillity and ease are produced, though there may be no sleep; when laudanum, on the contrary, is taken alone, sleep will, perhaps, follow, but is mostly succeeded by nausea, and a return of pain. Hence, the Turks and Arabians make strong coffee their common vehicle for opium, from its tendency to counteract the narcotic principle of the latter; and, on the same account, it is plentifully administered after the stomach has been evacuated of its contents, in cases of poisoning by opium.—*Medical Botany.*

The Bread at the Foot of the Alps is made of chestnuts; in the Abruzzi, and in Calabria, of Indian corn, and the two kinds are equally wretched. The chestnut bread of the Alps, occasions nodosities, swelled joints, and ultimately contracted limbs. The Indian-corn bread gives swine the mange, and man the scurvy. But where nothing else can be procured, man must be content to sustain life on such terms as he can. —*Times.*

Annual Quantity of Sugar consumed in Great Britain.—The quantity of sugar at present consumed in Great Britain may be estimated at 160,000 tons, or about 360,000,000 lbs.; which, taking the population at 16 millions, gives, at an average, 22½ lbs. for each individual. In workhouses, the customary allowance for each individual is about 34 lbs.; and in private families the smallest separate allowance for domestics is 1 lb. a-week, or 52 lbs. a-year.—*Jameson's Journal.*

Improved Milk.—Besides caseum and butter, milk contains salts, &c. which are not particularly desirable. M. Braconnot took 2½ litres (4.4 pints) of milk, heated it to 113 deg. F., gradually added dilute muriatic acid, and agitated the whole. The curd formed contained the caseum and butter, and, being separated from the whey, was gradually mixed with 5 grammes (77 grains) of crystallized sub-carbonate of soda, reduced to powder and warmed. No water was added, but the whole gradually dissolved. It had the weak acidity of recent milk, and formed about a half-litre of cream (a fifth of the first bulk,) capable of numerous applications in domestic economy. If made up to its first bulk with water and a little sugar, it forms a milk more agreeable than the original; or it may be flavoured, &c., and used as cream. If it be heated with about its weight of sugar, it becomes remarkably fluid, and forms a perfectly homogeneous syrup of milk, which will keep for any length of time, and which, by the mere addition of a sufficient quantity of water, forms a perfectly homogeneous white opaque liquid, which is in every respect like sugared milk of improved flavour. The syrup diluted with water forms a nourishing drink for invalids. Carefully evaporated, but not beyond a certain limit, or the butter would separate, it gave, when cold, a soft confection, which left for a twelvemonth in a loosely stopped bottle, underwent no change. This, when exposed in thin portions to the air, was rendered quite dry, and could then be crushed and kept for any length of time without change, being always reconvertible into useful states by the mere addition of water.—*From the French.*

Different kinds of Bread.—London Bread.—The method most followed to make the fermented bread is as follows:—

They dissolve in 36 lbs. of warm water, from 4 to 6 lbs. of salt, at the temperature of 84 deg. of Fah., and then add three pints of yeast: on the other hand, they make a hole in the midst of a heap of 280 pounds of sifted flour; and with the solution of salt, and sufficient yeast for the flour, they make a paste sufficiently thick, and which they term a quarter sponge; they then again cover it with more flour, and close the kneading trough with a piece of flannel. Three hours afterwards, they add 360 lbs. of boiling water to it, and knead up the mass with a new quantity of flour; this they term half sponge; five hours afterwards, they again add 108 lbs. of hot water, and work it with the remainder of the flour, for an hour at least; they then cut it into bits, again cover it with flour, and leave it at rest in a corner of the trough. Four hours afterwards, they knead it for half an hour, and then form it into loaves, which they

afterwards place in the oven. They judge when the oven is sufficiently hot, by throwing a pinch of flour into it, and which ought to become black instantly, but without taking fire; they place the loaves so near to each other in the oven, that when they rise, they press each other, and take the form of cubes. They leave them two hours and a half in the oven, and when they withdraw them, they take care to cover them, to prevent them as much as possible from losing their weight. This loss, from the baking, amounts to a ninth part of the total weight, and yet the loaves nevertheless become three times as large as when put into the oven. In London, they put half a pound of alum instead of the same quantity of salt, into the bread, as a seasoning. In the poorer parts of the country, they use equal parts of salt and alum.

Household Bread.—There are but few bakers who make this bread; it is ordinarily made in those families who bake their own bread. As the brown farina retains a much greater quantity of water than flour does, so this bread remains fresh for a longer time than the white bread, but is apt to crumble. As it is not generally well kneaded, so it has a particular taste, which, although a little sour, yet it pleases many palates. It has likewise all the imperfections of being the first baking in an oven which has become cold; and therefore they prefer to use sheet-iron ovens, and to substitute cast-iron or sheet iron in place of the vault of bricks; and which iron ovens also serve to bake other alimentary articles. Holmes's oven is of this kind, and derives its heat from a mass of cast-iron which projects from its side into the fire-place, and thus no flues are required.

Sea Biscuits.—To make the best biscuits, or the *American Crackers*, they take a good thin paste, and roll and double it many times, as if for puff-paste. The common sea-biscuits differ from the preceding, in not being made with so many doublings. They make a thick paste without leaven or salt, and in proportion as it extends beyond the feet, with which they knead it, they cut off the borders and throw them into the middle, and knead them anew. They thus obtain a biscuit, which breaks in plates. These are baked in a very low oven, which resembles a muffle.

Spiced Bread.—(Gingerbread.)—To make this, they dissolve half an ounce of potash, and a little alum, in hot water; they then melt in it an ounce of butter, and knead it up with quick strokes, together with three quarters of a pound of treacle, and an ounce of mixed spices, of which the composition is variable; but for the most part consists of ginger, canella, nutmegs, and the four spices. Carawayseeds, aniseseeds, raisins of Corinth, almonds, and other confectionary articles, are also sometimes added. We may also omit the alum, and replace the potash, by the carbonate of magnesia, which, by the strength of a small quantity of it, enables us to compound it as follows:—viz., 2 lbs. of flour, half an ounce of magnesia, 1 lb. and a half of treacle, 2 ounces of butter, and the necessary quantity of water to knead it, holding in solution a quarter of an ounce of tartaric acid, form a paste which will rise in half an hour. In France the spiced bread is made with honey, and rye meal, without any butter or water.

French Bread.—The bakers in France commence their operations at five o'clock in the morning, by mixing 5 pints of water, and 3 lbs. of leaven, reserved from the last baking, and as much flour as will make a paste, weighing 17 lbs. Ten hours afterwards they add 10 or 11 pints more water, and sufficient flour to make a paste of 40 lbs. weight; two

hours afterwards, 24 pints more water, and flour enough to make a paste of the weight of 120 lbs. From this paste they cut off a portion of three pounds in weight, to serve for the leaven of the next day's baking. Then, four hours afterwards, they make a new addition of 100 lbs. of flour, and from 70 to 80 pints of water, and which will yield a mass of about 300 lbs. weight. They then begin to beat the paste, and when it is well kneaded, they separate about 80 lbs. of it, which is to serve as the leaven for the next baking. This paste is so fluid, that the loaves cannot preserve their form before they have been exposed to the heat of the oven. For the second baking, after having mixed the quantity of flour necessary, by kneading it, they add the paste reserved from the former baking, and, when the mass is finished, they cut off a part weighing 80 lbs., and thus they proceed a third time, a fourth, and so on, until they have made twelve bakings. They thus continue to work for several days together, only they modify it after every fourth baking, by adding what they term a young leaven to the paste which each baking had impaired or weakened. If they would introduce into the paste either salt or yeast; they thin it in a proper manner with water, which contains yeast or salt in solution. They also use yeast for the soft bread. A quarter of a pound of the yeast from beer is equal to 8 lbs. of the paste leaven; so that 4 ounces of yeast are equivalent to 20 lbs. of the paste. The paste in which they have mixed the yeast, must not, however, be mixed with that containing leaven.

In France, they estimate the consumption of bread, including that used with soups, at 2 lbs. and a quarter per person; whilst, in England, it is not quite 13 ounces.—*From the French.*

Night-Angels is the fantastic name given by an American patentee of the name of Cook to certain new dishes and caps for preventing bugs from ascending the posts of bedsteads. The best defence, as Dr. Jones, of the *Franklin Journal*, well observes, against these nocturnal tormentors, is cleanliness; and those who lack the industry necessary for their destruction, will call in vain either on Hercules, or Mr. Cook's Night-Angels, to protect them from the fangs of these disturbers of their repose. "The effect to be produced by these Night-Angels," Dr. Jones adds, "we have repeatedly attained by a magic circle around the lower end of each bed-post. This circle was merely a line made with chalk, over which the legion cannot pass; the loose particles upon which they tread giving way beneath their feet, and precipitating them to the lower regions."—*Mechanics' Mag.*

Keeping Apples.—When fruit, however mature and finely ripened, is exposed in a dry apartment, and laid singly on open sparred shelves (as is often practised), the action of the air speedily extracts the juice from them; and in the month of November and December, Ribstons, Nonpareils, and other fine apples, and the better kinds of pears, which should remain in good condition for several months after, become shrivelled, and the pulp stringy, unpalatable and undigestible. Packing in jars closely cemented or sealed up has been found to prevent this, where it is unavoidable to deposit fruit in a dry apartment: but such a state of atmosphere as is rather moist, without the place itself being absolutely damp or wet, is conceived to be most favourable for the fruit retaining its original freshness in: and as many persons have cellars at the surface of the ground, or a little below it, who have no regular fruit-rooms, my experience would induce me to advise them to store their fruit in a corner of

the former, in preference to dry presses and closets in higher flats of the house.—*Gardeners' Mag.*

Terro-Metallic Teeth—M. Fonzi is the original inventer of the terro-metallic teeth lately introduced to London from Paris, and, for every quality required in artificial teeth, found greatly superior to any of the kind hitherto in use. These teeth are now sold, even by the cheapest dentists, at two and three guineas each. It is M. Fonzi's intention to reduce the price to 5*s.* or 7*s.*, by which means they may come into universal use, and the humblest female may thus mend her charms in this department as readily as she now does in the article of hair. This we think will be a very great improvement, and M. Fonzi will deserve immortal honour for the attempt to bring it about. We do not believe there is a class of men in the country who so soon make fortunes as dentists in full employment; and the reason is, because there are so few in the trade that it is held as a mystery. It is supposed to be something too high for a mechanic, and yet too low for a regularly educated medical man. As society advances all mysteries will be revealed, the principle of the division of labour will be applied in this case as in every other, and the business of the dentist will resolve itself into that of the surgeon dentist, the mechanic dentist, and the tooth manufacturer. The latter requires no more skill than a china manufacturer; nor the mechanic dentist than a barber, certainly not a tithe of the science of a carpenter and joiner. The raw material of the terro-metallic teeth is the same as that which is burnt into china, with the addition of a metallic oxide, so that its cost and its manufacture into teeth can be no great object, and the wages of the operator or mechanic dentist in fitting in the teeth when once there is such a general demand as we contemplate, will not exceed those of a journeyman peruke-maker.—*Ib.*

On the manufacture of Maçaroni from Wheat.—I went the other day to visit a *fabrica* of macaroni, which may well be styled the Italian's staff of life. I never could understand why in England we should be indebted to Italy for so useful and wholesome an article of food, and I confess myself to be still in the dark upon the subject. No one will deny that the finest wheat, if not grown in England, may always be obtained there; and it is idle to suppose that skill is wanting for its proper manufacture. The process is very simple, and though it is not easy to explain machinery without a diagram, I shall endeavour to set it, to all intents and purposes, clearly before you. I should first apprize you that the finest flour is alone employed in the making of macaroni: this is mixed with as small a quantity of water as will suffice to convert it into paste; it thus becomes much too hard and consistent to be kneaded with the hand, and in order to its being done effectually, the following contrivance is resorted to. A wooden pole, about fourteen feet long, is fastened at one end to a post driven into the ground, by a chain, so as to be lifted up and let down again with ease. Near the post to which this is fastened, stands a low platform on which the paste is disposed, and that part of the pole which is immediately over the platform is prism-shaped, so that it comes in contact with the paste in the form of a thick wedge. At the other extremity of the pole are stationed two men, whose employment is to keep moving it to all parts of the paste, and pressing it down with their united weight, which at a distance of ten feet as they are from the pasteboard, acts with very considerable effect. When the paste is sufficiently worked, it is transferred to a hollow cylinder, at the bottom of

which is a cast-iron plate perforated with holes—these are of different forms, and hence the variety of shapes in which macaroni appears. Over the paste is what is called in dairy countries a *follower*, or cylindrical piece of wood, exactly fitting the cylinder, and this is forced down upon the paste by means of a screw of great power, worked by two or more men. The paste then issues from beneath, through the cast-iron plate, and as it issues very slowly, is partially baked by a fire stationed for that purpose in a semi-circular form round the space immediately below the cylinder. As it descends it is gradually drawn away, and being suspended across the room on rods, it becomes fit for use in a day or two. Such is the simple process of making macaroni—a food wholesome and nutritious: which forms the principal food of the lower orders of Italians, but which in England is only found upon the tables of the rich, owing to the enormous price at which it is sold; and which price is justified on the plea that it cannot be manufactured here. It is my firm belief that if any spirited individual would commence its manufacture on an extensive scale, the Italian macaroni would soon cease to be an article of importation.—*Walter's Letters from the Continent.*

Adulteration of Bread.—Although pure and nutritious bread is so necessary to health and life, there is no article more liable to sophistication. The practice of mixing potatoes with the dough is generally known. Potato-starch is used for adulterating flour. A few months since an eminent flour factor showed me a powder which he said had been sent him as a substance which might be mixed with flour without discovery, and requested me to examine it, declaring his intention, at the same time, of publishing the transaction. Inspection alone was sufficient to convince me that the powder was potato-starch, and a few experiments soon decided the point. This fraud has no other bad effect than in lessening the quantity of nutritious matter which a given quantity of the bread should contain; beside the extortion of charging full price for an article of less value! Inspection by a high magnifier will detect potato-starch in flour, by its glistening, granular appearance. We have heard of bones, burned to whiteness, and ground to an impalpable powder, being used to adulterate *thirds* flour, which, being of a somewhat gritty nature, will disguise the grittiness, which it is almost impossible to deprive bones of, be they ever so laboriously ground. This fraud is easily detected; for, if much dilute muriatic acid, that is, spirit of salt mixed with water, be poured on such flour, there will be an effervescence or boiling up; and if the liquid be thrown on a filter of paper, the portion which runs through the paper will let fall a white heavy deposite, when pearl-ash is added. Chalk and whiting are also adulterations, which, in small quantity, are often mixed with flour, and, although such admixtures are not noxious to health directly, they are injurious in many ways. They may be readily detected by pouring on a large quantity of dilute sulphuric acid, that is oil of vitriol mixed with six or seven times its weight of water; if an effervescence ensue, it is proof that there is adulteration, and if, after filtration, as before directed, the addition of pearl-ash to the clear liquor produce no muddiness, or a very slight degree of it, the presumption is, that the adulteration was chalk or whiting. Alum is a well-known sophistication of bread, not used on account of its quantity, but to disguise a bad quality of flour; it is said to whiten ill-coloured flour, and to harden and whiten bread made from flour which has been malted. By some respectable bakers it has formerly been used, and might still be used, if there were not a law against it, with perfect

safety; in so small a quantity as half a pound of alum to one cwt. of flour, it could not be in the least degree injurious, for this would be but nine thirty-fifths of an ounce to the quartern loaf. When used in double this quantity, as it often is, it becomes discoverable to the taste when the bread grows stale. Be this as it may, we can easily detect alum in bread, for it is only in bread that it need be suspected, by pouring boiling water on it, letting it cool, pressing out the water, boiling it away to one-third, allowing it to cool, filtering it through paper, and adding to the clear liquor some solution of muriate of lime. If a considerable muddiness now appear, it is proof of adulteration, and none other can well be suspected than alum. Salt, which, in small quantity, is absolutely necessary to the flavour of bread, is used by fraudulent persons as an adulteration; for a large quantity of it added to dough imparts to it the quality of absorbing, concealing, and retaining a much greater quantity of water than it otherwise would. Bread made from such dough, will, on leaving the oven, come out much heavier than it ought, and the additional weight will be merely water. Fortunately the taste of such bread is a sufficient index to its bad quality. It is rough in its grain; and has this remarkable quality, that two adhering loaves will generally separate unevenly, one taking from the other more than its share. The following account of a new and execrable adulteration has been lately given in Brande's Journal:—"The journals of Holland have for some time announced that sulphate of copper, or blue vitriol, was employed in that country to assist in the fermentation of bread; and at the same time that they pointed out the dangerous nature of this substance, they said that it was used because it was supposed to render the bread whiter, more compact, more healthy, and better fermented. The magistrates of Brussels caused thirteen bakers and five druggists to be brought before them for being concerned in this adulteration; and it appeared, 1st, That the employment of the process came from France, and that, by the use of *blue alum*, a better fermented and whiter bread was obtained than by ordinary processes; 2nd, That the use of the process was announced in the public journals, and in a prospectus which, being printed, was distributed; and stated that a patent secret for the preparation of leven was to be sold, but without describing in what it consisted; 3rd, That the bakers inquired for the substance under the term of *blue alum*, and that the druggists gave, under this name, blue vitriol, or the sulphate of copper." —*Dr. Lardner's Cabinet Cyclopædia. Domestic Economy.*

New Bread.—A Parisian chemist has established a bakehouse for bread made from potatoes, which is animalized by the addition of the gelatine made from bones. In this way a food which is said to be equally pleasant and more nutritious than wheaten bread is obtained, at half the expense of the latter. A large quantity of biscuits, for the use of the African expedition, has been made upon this plan. In a time of scarcity of corn, the discovery will prove a great blessing.—*Mechanics' Mag.*

Vegetable Extract.—In the north of France an excellent extract of the herbs used in soups and broths is made by boiling them very slowly with a sufficient quantity of salt, and afterwards evaporating the fluid. A little of this extract, dissolved with gum arabic in hot water, is said to make capital soup.—*Ibid.*

Butter.—The *Journal des Connaisances Usuelles* gives an account of the means used in the Canton d'Issigny to procure excellent butter in winter. The cows are warmly clothed, so as to cause them to calve in

the autumn, as it is found that the milk, after this process of nature at that time, becomes more abundant and richer in quantity; and during the severest weather in the winter, they were constantly kept clothed, and fed in the open air, as the taste of the butter is said to be much injured by confinement in the stable. The butter of this district is superior to any other on the continent.—*Mechanics' Mag.*

Economical Water Colour for Rooms.—Take a quantity of potatoes and boil them, then bruise them, and pour on boiling water until a pretty thick mixture is obtained, which is to be passed through a sieve. With boiling water then make a thick mixture of whiting, and put it to the potato mixture. To give colour, if white is not wanted, add the different-coloured ochres, lamp black, &c., according to circumstances. This paint dries quickly, is very durable, and has a good appearance to the eye.—*French paper.*

Cultivation of Potatoes.—A French soldier placed half a dozen potatoes at the bottom of a cask, upon a layer of sand and fresh earth, three or four inches thick; when the stalks had risen a few inches, he bent them down and covered them four or five inches deep with the same mixture. He continued this operation until the cask was full. Six or seven months after, upon emptying the vessel (which stood in a court-yard) he found that the half dozen potatoes had produced an enormous quantity of new ones, from the portions of the mother stems, which had been successively laid down and covered.—*Jour. des Connais. Usuelles.*

Wine from unripe Grapes.—Dobereiner of Jena, who ranks among the first of German chemists, has latterly been occupied in making experiments on the possibility of ameliorating wine, derived from the juice of unripe grapes; and has discovered, that it may be rendered perfectly sweet, by injecting the powder of bones, which have been reduced to a state of whiteness by combustion.—*Mechanics' Mag.*

Seed Dealers.—A cottager may often make a few shillings by saving seeds, and selling or exchanging them with his neighbours or with the seedsmen. In different parts of Scotland this is done by labourers, weavers, and other mechanics. Torryburn is, or used to be, famous for its seeds of German greens; another village near Stirling for leek-seed. Dumfermline and Paisley were also noted in this way; and what are called the Russian stocks are raised from seeds saved by the weavers of Silesia and Saxony.—*Loudon's Cottage Gardening.*

Dandelion Coffee.—"Dr. Harrison, of Edinburgh, prefers dandelion coffee to that of Mecca; and many persons all over the Continent prefer a mixture of succory and coffee to coffee alone. Dig up the roots of dandelion, wash them well, but do not scrape them, dry them, cut them into the size of peas, and then roast them in an earthen pot, or coffee roaster of any kind. The great secret of good coffee is, to have it fresh burnt and fresh ground."—*Ib.*

Adulteration of Milk.—The subject of the adulteration of milk has been lately investigated with great care, by M. Barruel of Paris. Although his observations are intended to apply only to the milk of that city, yet there is little doubt that they will also be found applicable in a greater or less degree to all great towns. He sets out with stating that all instruments for ascertaining the purity of milk, which are calculated to attain this end by pointing out differences in its density or specific gravity, are inaccurate and useless. For, on the one hand, pure milk differs much in density, according to the fodder used by the dairy-man for his cows—the

butyraceous matter which imparts lowness of density, being made to preponderate by some sorts of food, and the caseous part, which increases the density, being made preponderant by other sorts. And, on the other hand although water, the ordinary substance with which milk is adulterated by the dealers in the French capital, would alone cause a great diminution of density, the dealers know very well how to prevent that effect, and so render the areometer useless. For this purpose, it is only necessary to dissolve in the milk a little sugar-candy, which is required at all events in order to correct the flat taste imparted to milk by diluting it with water. The result of M. Barruel's inquiries on the adulteration of milk in Paris, is, that no positively noxious subtsance is ever to be found in it; that a common practice is to remove a considerable portion of the cream, by allowing the milk to stand for a limited time, and then to dilute the remainder, or skimmed milk, with water, and to give it the apparent qualities of new milk in one or other of the manners now to be mentioned. The opacity of the milk being much diminished by the water, so that the milk acquired a blueish appearance, it was at at one time usual to correct this defect, by previously mixing wheat-flour with the water with which the milk was diluted. But this adulteration was too obvious to the senses. Any person even of indifferent delicacy of palate, could detect the altered taste of the milk; and besides, after two hours' rest, the flour sank to the bottom, restoring the translucent blueness of the milk, and pointing out the nature of the fraud. To prevent this inconvenience, the dealers boiled the flour in the water before mixing it with the milk; and in this way an opaque mixture was procured, which retained its opacity on standing. As even with this addition the fabricated liquid had a flat taste, sugar or sugar-candy was dissolved in it, by which means the peculiar sweetness of the milk was partly restored. This adulteration, however, has become so easy of detection by means of iodine, which renders the mixture blue by its action on the fecula of the flour, that M. Barruel believes that the fraud now described is very little practised in the present day at Paris. In Britain, where the municipalities take no charge whatever of the purity of this most important article of food, it may be presumed that the adulteration with flour, sugar, and water is common enough, as it is a simple and cheap mode of accomplishing every purpose of the fraudulent dealer. The best mode of proving the presence of farinaceous matter in such mixtures, is to heat the milk with a little sulphuric acid, to coagulate the casein, to filter the whey, and then to add to the latter the tincture of iodine; upon which a fine blue colour will be struck. Driven from this species of adulteration, the Parisian dealers have latterly resorted to another so ingenious, that M. Barruel conceives they could not have discovered it, without the aid of some scientific person. The method is simple, so cheap, that for tenpence the opacity and colour of milk may be imparted to thirty English pints of water, and so far secret that no disagreeable taste is communicated. This is nothing more than the employment of an emulsion of almonds, for which some dealers, more greedy and less cautious than the rest, have substituted hemp-seed, which, however, is apt to impart an acrid taste. By either of these means the milk may be diluted to an indefinite extent; and the only corrective required is a little sugar-candy to remove the flat taste. A peculiar advantage possessed by this mode of adulteration over every other, is, that the vegeto-animal matter or vegetable albumen of the emulsion by which the oil of almond is held in supension, is coagulated, or curdled, like casein, by acids. The method recommended by M. Barruel for detecting the fraud is

founded on two circumstances,—the greatly inferior quantity of coagulum formed by acids in the mixture of milk and almond emulsion, compared with that formed in milk alone, and the facility with which, by kneading the coagulum with the fingers, oil may be squeezed out of the former, while none exists in the latter. On examining carefully four different specimens of pure milk, procured from different quarters in Paris he found that the 300 parts of each, coagulated by heating them with an equal volume of vinegar, gave each a quantity of curd, which, when well drained, and equally pressed between folds of bibulous paper weighed 29 parts; and that the same quantity of milk taken from a cow in presence of a person sent to procure it, gave 30 parts of curd. He then found, that when the same milk was mixed with various portions of water, the quantity of curd was exactly in the inverse ratio of the proportion of water added. The water, therefore, did not prevent any portion of the curd from being thrown down by the usual modes of curdling the milk. He next found, that, if a given quantity of sugar was added to the mixture of milk and water the quantity added could be separated exactly by evaporating the whey to the consistence of an extract, heating this with alcohol, filtering the alcoholic solution, and evaporating to dryness. He then also found that, when equal parts of almond emulsion and milk were mixed together, 300 parts of the mixture, curdled by vinegar as above, gave 16¼ parts of curd; and that the same quantity of a mixture containing two parts of emulsion to one of milk, gave only 10 4-5th parts of curd. So that although, as was to be expected, the adulteration with almond emulsion did not lessen the quantity of curd to the same extent as adulteration with water only, yet the decrease was very great, and very nearly in the ratio of the quantity of emulsion added. Lastly, on placing pure curd on white paper, no oily matter was thrown out; but the curd procured from the mixture of milk and almond emulsion, besides being less firm than the former, gave out in 24 or 48 hours a quantity of oil sufficient to stain the paper. Another adulteration to which milk is subjected in Paris, is with carbonate of potass or soda. The object of this variety of adulteration is, in the hot summer months, to prevent the milk from becoming sour and curdling, or to break down the curd and correct ascescency when the milk has actually become spoiled. In this process, acetate of potass or soda is formed. Neither of these salts, in moderate quantity, is injurious to the health; indeed, acetate of potass exists naturally in milk, and is the source of some embarrassment in the detection of the present fraud. The mode of analysis adopted by M. Barruel is as follows:—As the alkaline acetates are converted by incineration into carbonates, he endeavoured, by means of this property, to ascertain the quantity of alkali naturally contained in whey. He therefore, evaporated a certain quantity of whey to dryness, incinerated the residue in a platinum crucible, and procured an alkaline ley from the remainder, which by the process recommended by Decroisil for measuring the strength of alkaline fluids, indicated from one and a half to two degrees of alkalinity. Hence any increase of alkaline strength above the last of these points, must be considered as owing to the intentional addition of carbonate of potass or soda. This is evidently the most difficult of the processes recommended for detecting the various adulterations specified in M. Barruel's paper. Indeed a chemist alone could conduct it. The others may be easily executed by any body.—*Edinburgh Medical and Surgical Journal.*

To prevent Milk becoming Sour.—To prevent milk from turning sour

and curdling, as it is so apt to do in the heat of summer, the milk-men of Paris add a small quantity of sub-carbonate of potash or soda, which saturating the acetic acid as it forms, prevents the coagulation or separation of curd; and some of them practise this with so much success as to gain the reputation of selling milk that never turns. Often when coagulation has taken place, they restore the fluidity by a greater or less addition of one or the other of the fixed alkalies. The acetate which it thus formed has no injurious effects, and besides milk, contains naturally a small quantity of acetate of potash, but not an atom of free or carbonated alkali.—*Mechanics' Mag.*

Preservation of Butter.—M. Thenard recommends the method used by the Tartars; which consists in fusing the butter in a water-bath at a temperature of 190 deg. Fahr., and retaining it quiescent in that state, until the caseous matter has settled, and the butter become clear; it is then to be decanted, passed through a cloth, and cooled in a mixture of salt and ice, or, at least, in spring water, without which it would crystallize, and not resist so well the action of air. Preserved in close vessels and cold places, it may be kept for six months as good as it was on the first day, especially if the upper part be excepted. If, when used, it be beaten up with one-sixth of cheese, it will have all the appearance of fresh butter. The flavour of rancid butter may, according to M. Thenard, be removed almost entirely by similar meltings and coolings.—*Brande's Journal.*

Effectual means of Curing a Cut, Bruise, or Burn, is said to be the inside coating of the shell of a raw egg. Apply the moist surface to the wound; it will adhere of itself, leave no scar, and heal any wound, without pain, more speedily than any salve or plaster in the universe.—*Mechanics' Mag.*

Beer from Sugar.—For making excellent ale or table-beer, it is not absolutely necessary to use malt. To conceive this subject rightly, we must consider that it is the sugar of the malt which undergoes fermentation, and that any other sugar will ferment just as well, although no other sugar is so cheap. Economy and long habit have established malt-sugar as a brewing material, but cane-sugar will afford an excellent drink. To persons residing in the country, and far from breweries, as well as to those who do not choose the great trouble of managing malt, this is a valuable fact. Another advantage of cane-sugar is, that the apparatus necessary for converting it into beer is much more simple; all that is required, is a cask which has no bung-hole, or has it well stopped up. This is to be set standing on either of its ends: a cock is to be fixed in one of the staves, about an inch above the bottom chimb, so that in drawing off the liquor, the sediment cannot also run. In the centre of the top of the cask, that is, in the centre of its other end, a hole is to be bored, of such size as will admit a large bottle-cork. Let us suppose that the cask holds 10 gallons, and the drink is to be tolerably strong ale. The proper quantity of hops required for 10 gallons of ale, in this process, will be about 1½ lb. On this quantity, contained in any convenient vessel, pour on 11 gallons of boiling water; or, what is much better, boil the hops in the water for about five minutes, and no more; then strain off the hops: in the strained liquor dissolve 14 lbs. of sugar, and mix in a pint of yeast of the best quality. Pour the whole into the cask: it will soon begin to ferment; it will throw up its yeast through the cork-hole at top, and, this being retained within the external rim of the chimb, it will for the

most part, fall back into liquor, and run back into the cask. It will require, at the ordinary temperature of summer, so much as three weeks or a month to complete the fermentation. For the last fortnight the cork may be generally kept in the hole; but it should, once every two days be removed, to give vent to the fixed air, and then replaced. When the fermentation appears at an end, the taste of the sugar will almost entirely have disappeared, it will be barely perceptible. The cork may then be permanently driven in, and in four days the ale will be fit for draught, or for bottling. As to the quality of the sugar, it is a matter of little consequence; white sugar will afford an ale scarcely coloured; brown sugar will impart proportionate colour, and not quite so pure a flavour. Should colour be an object, it may be communicated by the raspings of an over-baked loaf, or by scorched treacle; but this is matter of little moment. The drink will spontaneously fine itself. To persons who have acquired an inveterate predilection for the abominable and varied flavours which the skill of the brewer enables him to communicate, this pure and simple drink may be less pleasing; but it is singular how soon the consumer acquires a high relish for it, and prefers it to every other. There is a purity of taste belonging to it quite different from the indescribable jumble of tastes so perceptible in common ales, and a light sharpness combined with tenuity, which is much more agreeable than the glutinous or mucilaginous softness of even the best ales. But it has one advantage which places it above all competition, and that is its lightness on the stomach; this, when compared with the sickly heaviness of malt-ale, is really remarkable. The whiter the sugar the lighter will be the ale; and age greatly conduces to the same end, provided that the drink is sound, which is best ensured by bottling. Hops are by no means the only bitter which may be made use of for preparing and flavouring such ales; others can much more conveniently be procured in certain situations. Mixtures, in various proportions, of wormwood, powdered bitter oranges, gentian root, and rind of Seville oranges, will afford an excellent bitter, perhaps more wholesome than hops, and, if skilfully combined, to the full as palatable: in this position the *brewers cannot refuse to bear me out,* for reasons with which many of them are acquainted. Gentian, and particularly quassia, must be used sparingly; for the bitterness of these is of so lasting and penetrating a kind, that much of it is sure to be disagreeable. It has been shown by M. Dubruntaut, that a good beer can be produced from potatoes: the potatoes are to be grated to a pulp; this is to be well mixed with boiling water, and ground barley-malt is to be added. The liquid being drawn off, is to be hopped in the usual way, yeast added, and the fermentation induced. The beer thus produced, after being bottled, was found greatly to resemble Paris beer. In certain parts of Ireland an excellent beer is brewed from parsnips, by a process somewhat like the foregoing, except that no malt is used: the bitter employed is hops. In short, malt is by no means necessary to the production of wholesome and agreeable beers.—*Lardner's Cyclopædia; Domestic Economy.*

The Croup, one of the most dangerous and rapid of the diseases of children, may be effectually checked by the external application to the throat of equal parts of camphor, spirits of wine, and hartshorn, well mixed together.

USEFUL AND ORNAMENTAL ARTS.

On making Artificial Pearls.—These are small globules, or pear-shaped bulbs, blown in thin glass, and each pierced with two opposite holes, by which it may be strung. These are afterwards prepared in such a manner as to greatly imitate the rounded and brilliant concretions, reflecting the iridescent colours, which are found in certain bivalve shells, such as the pearl mussel, &c., and which bear the name of oriental pearls. We can perfectly imitate the brilliancy and reflection of these natural pearls, by means of a liquid, termed Essence of Pearl, and which is prepared by throwing into liquid ammonia the brilliant particles which are separated by friction and washing from the scales of a small river fish named the Bleak (Cyprinus albernus). These pearly particles, thus suspended in the ammonia, can be applied to the whole interior of these glass bulbs, by blowing it into them; after which, the ammonia is volatilized by gently heating them. It is said that some manufacturers do not apply the ammonia; but instead thereof, suspend the pearly particles in a solution of isinglass, well clarified, and which they drop into the bulbs, and then turn them in all directions, in order to spread it equally over the interior surfaces. There can be no doubt, that in this mode of applying the pearly mixture, the same success will be obtained as in the before mentioned process, and that it will afford a layer of the same thinness and brilliancy. It is important, to succeed in the perfect imitation of pearls, that the glass bulbs or pearls employed should be of a slight blueish tint, opalized, and be also very thin; and likewise, that the glass should contain but little potash, or oxide of lead. In each manufactory of these artificial pearls, there are workmen exclusively employed in the blowing of these bulbs, and which requires a great dexterity to succeed well therein,—a dexterity, indeed, which can only be acquired by long practice. The French manufacturers of these artificial pearls have at length attained a degree of perfection before unknown. We must add, that the bulbs are finally filled up with white wax.—*From the French.*

Colza Oil.—Colza Oil, or Huile de Colza, is extracted from the grain of the Brassica Arvensis, or Campestris, a species of cabbage. The Colza is very much cultivated throughout France and the Netherlands, on account of its various and useful qualities. When the seed is ripe, which generally happens in the month of July of the following year, the plant is cut, tied in small bundles, and put under a shed, or any covered and airy place, to dry. The grain is beaten out, and cleaned in the manner commonly used for the extraction of wheat or other grain, and is then treated for the oil. As the oil comes from the press it may be directly used, with potash, for the fabrication of soft soap; but if intended for burning, it is necessary that it should undergo another preparation, in order to separate from it its mucilage and the colouring matter, which prevents its ready combustion. We are indebted to M. Thenard for the method of purification. It consists in mixing two parts of sulphuric acid (concentrated) with a hundred parts of *oil*, which are to be well stirred together until the acid combines with the mucilage and colouring matter, which are gradually precipitated in flakes of a blackish green

colour, after which a quantity of water equal to double that of the oil is added; the whole is then freely agitated with the intention of depriving the oil of the free acid; it is then left to settle for the space of ten days, at the end of which time the oil, which is upon the surface of the water, is decanted into tubs, in the bottom of which are holes filled with cotton, through which the oil is allowed to filter, when it is perfectly pure. This method of purification is applicable to all seed oils. The oil of Colza thus prepared, has very little odour, is of a yellow colour, and has a sweetish taste. It is not very soluble in alcohol. When congealed it crystallizes in small needles diverging from a centre.—*Franklin Journ.*

Large Still.—The largest condenser for distilling gin ever manufactured has just been made for Mr. Hodges, by Mr. Joseph Hulls, of High Wickham. Its height is 14 feet 6 inches; its dimensions 8 feet. It is calculated that it will distil 10 gallons per minute, 6,000 per day, or 1,878,000 per annum.—*Morning Herald.* The productive capacity of this still is by no means so unrivalled as represented. In many Scottish distilleries, where alembics are employed from 52 to 54 inches in diameter, and about 8 in depth, no less than *eighty gallons* are produced every three minutes and a half.—*Mechanics' Mag.*

Economic Lighting.—At the Tulloch, Bleachfield, a young man named A. Reed, has constructed an apparatus by means of which he is enabled to procure from the wood which they are in the practice of burning in order to obtain acetic acid gass, sufficient to light the whole premises. By this ingenious device a most important saving is effected, since no more wood is necessary for both the gas and the acid than was formerly used for the acid alone.—*Glasgow Chron.*

Plaster Casts.—First size them over, and when the size is properly dried, varnish them over with copal varnish. The effect is beautiful—the trouble very small. Plaster casts assume by this process almost the appearance of marble sculpture.—*Mechanics' Mag.*

Cutting Glass with a hot Iron.—Mr. Faraday has devoted four pages of his recent work, on Chemical Manipulation to an account of the methods of cutting glass with a hot iron, but he has omitted one precaution which I have found important in cutting large tubes, vials, &c., that of not making the iron too hot. It should be heated to a redness barely visible in day-light. If in this state it be caused to vibrate a few times round the tube along the track where the division is to be made, and a drop of water put upon the spot, a simple fracture, without side flaws, will be obtained. By pursuing this method, especially if a trace be made beforehand with a file, a long tube may be cut up into sound, well-defined and narrow rings, without a single instance of failure.—*Correspondent of Professor Silliman's Journal.*

Razors.—Mr. Knight, president of the Horticultural Society, has devised the following improved contrivance for sharpening razors:—This consists of a cylindrical bar of cast steel, three inches long without its handle, and about one-third of an inch in diameter. It is rendered as smooth as it can readily be made with sand, or, more properly, glass-paper, applied longitudinally; and it is then made perfectly hard. Before it is used, it must be well cleaned, but not brightly polished, and its surface must be smeared over with a mixture of oil and the charcoal of wheat straw, which necessarily contains much siliceous earth in a very finely reduced state. In setting a razor, (observes Mr. K.), it is my practice

to bring its edge (which must not have been previously rounded by the operation of a strop) into contact with the surface of the bar at a greater or less, but always at a very acute angle, by raising the back of the razor more or less, proportionate to the strength which I wish to give to the edge; and I move the razor in a succession of small circles from heel to point, and back again, without any more pressure than the weight of the blade gives, till my object is attained. If the razor has been properly ground and prepared, a very fine edge will be given in a few seconds; and it may be renewed again, during a very long period, wholly by the same means. I have had the same razor, by way of experiment, in constant use during more than two years and a half; and no visible portion of its metal has, within that period, been worn away, though the edge has remained as fine as I conceive possible; and I have never, at any one time, spent a quarter of a minute in setting it. The excessive smoothness of the edge of razors thus set led me to fear that it would be indolent, comparatively with the serrated edge given by the strop; but this has not in any degree occurred; and therefore I conceive it to be of a kind admirably adapted for surgical purposes, particularly as any requisite degree of strength may be given with great precision. Before using a razor after it has been set, I simply clean it on the palm of my hand, and warm it by dipping it into warm water; but I think the instrument recommended operates best when the temperature of the blade has been previously raised by the aid of warm water.*—*Journal Royal Institution.*

The Petrisseur, or mechanical Bread-Maker. (See the Engraving.) — The invention is the subject of a French patent by Messrs. Cavallier and Co of Paris; an English patent for it has also been taken out by Mr. Poole, of Lincoln's Inn, as agent to the French inventers. *a a a a* in the engraving, represent a strong wooden trough nearly square, but tapering downwards a little into a less area, and having a curved or semi-cylindrical bottom; the lower part of this trough is lined with sheet-iron, as shown at *b b*; and it is divided longitudinally by a vertical partition *c*. The lower edge *d* is reduced to an acute angle, and covered with iron, to form a scraper to the surface of a hollow cast-iron cylinder *e*, which is made to revolve underneath it; for this purpose, the axis of the cylinder *e*, after passing through the side of the trough, carries a spur-wheel *f*, which is put into motion by a pinion *g*, when operated upon by a winch *h*. At *i i* are, what are described by the inventer, as "bags or seats, they extend downwards, so as to close the vertical jag or notch which is formed to receive them at each extremity of the trough." — "These pieces (are further stated to) have two cheeks in the interior which serve to keep the scraper sideways." The bearings of the toothed wheels *f* and *g*, are formed in an upright bar at each end of the trough, and they are connected by the same to the vertical partition *c d*, so that when it is necessary to increase the space between the roller and the curved bottom of the trough where the dough is formed, the handles *k k* of two levers of the second class are lifted; which being connected near to their fulcra (one of which is brought into view at *l*) to the upright bars before mentioned, raise the roller, the scraper, and the toothed gear altogether, to any height within the range shown by the slot mortices *m m* through which the levers pass, and they are fixable at any required height, by

* Probably this explains the razor-strop makers' recommending a razor to be stropped after using, before it is put by in its case:—thus leaving it in good condition.

means of a bolting pin *n* which passes through the levers, and the morticed iron frame *m m*. To adjust the scraper *c d* to the roller *e*, screws of the ordinary kinds used for that purpose are employed; these have globular heads, with holes through them, as shown at *o o*, for the reception of a pin key, by the turning of which the scraper is brought parallel to, and set at any required distance from the cylinder: the whole apparatus is supported upon strong wooden legs and cross bars, as represented in the drawing. The required quantity of flour, yeast, and water, or other ingredients used by bakers in the preparation of bread, are to be well mixed in the trough by means of the rake (as shown at *p* in the figure), and the kneading is then to be commenced, by causing the mixture to be forced under the cylinder in the trough as it is turned round by the winch. When all the dough has passed from one compartment to the other, the winch is to be turned in the opposite direction, by which the dough will be returned into the first compartment; and thus the dough is to be alternately forced from one side of the roller to the other by changing the direction of the motion until the operation of kneading is perfected. It should not be overlooked (says the patentees), that by the Petrisseur, or dough-kneading machine, the flour is better and more equally blended; and that each particle is placed in immediate contact with the water. Hence it not only imbibes all the water that it is susceptible of absorbing, but requires more than mere manual labour could communicate to it. In this respect also, the baker can easily determine the necessary increase. In short, the kneading of dough by the mechanical means under consideration, differs only from the ordinary process by being more *perfect*. For instead of blending flour by the uncertain and unequal arm of man, the uniform and steady action of the roller is substituted, for that desirable purpose. This machine is exhibiting at the *National Repository*, at Charing Cross; the foregoing description (which differs from a pamphlet printed by the patentees), is from the *Register of Arts*, part xxv.

Size for Illuminators, Artists, &c.—Four ounces of Flanders glue and four ounces of white soap are to be dissolved on the fire in a pint of water, two ounces of powdered alum added, the whole stirred and left to cool. It is to be spread cold with a sponge or pencil on the paper to be prepared, and is much used by those who have to colour unsized paper, as artists, topographers, &c.—*From the French.*

Artesian or Overflowing Wells.—The irruption of the water, on first piercing these subterranean reservoirs, is often very violent, and is no small proof of the copiousness of many of these wells. Some striking examples of this are quoted from England in the Bibliotheque Universelle, t. xxxix. p. 199. A Mr. Brook had sunk a bore in his garden 360 feet deep, and 4.5 inches in diameter, from which the water was discharged so copiously, that it not only overflowed the whole yard round the house, but also submerged the adjoining cellars. The damage was so great that the neighbours lodged a complaint, and the police were required to interpose. Two men now tried to close the bore with a wooden peg, but they were constantly driven back by the violence of the water, even when a third came to their assistance. They were equally incapable of restraining the water by an iron stopper. At last they took the advice of a mason, and planted several tubes of small diameter over the bore, and thus succeeded at last in mastering the water. At a Mr. Lord's, in Tooting, where a bore had been closed, the water worked with such

violence under the ground, that it burst forth in a space 15 yards in circumference, and certainly the walls would have been brought down if free vent had not been given to it. This spring, say the informants, on account of the height of its jet, and the quantity of water (600 litres per minute), is worthy of being in a public square.' The stream of a well belonging to a neighbour of Mr. Lord, drove a water-wheel of 5 feet in diameter, and this again set a pump in motion which carried the water to the top of a three-storied house. We quote this passage from an article in *Jameson's Journal*, No. 17, to direct the special attention of the reader to the whole of the interesting and important paper.*

Scraping and Sweeping Roads.—Mr. Boase, of Albany Street, Regent's Park, has invented two machines for this purpose, which will be found described and engraved in the *Gardeners' Magazine*, No. 24. Of their economy is the following:— The *scraping machine*, drawn by two horses, and attended by one man, will clean five miles of road, 24 feet wide, in eight hours. Two additional men will be required to throw the scrapings off the road, and clear the water-courses. The same work would require twenty five men *per diem*, with scrapers, according to the present method.

Comparative Expense.

		£	s.	d.		
Machine.	Two horses, at 6s. each -	£0	12	0		
	Three men, at 2s. - - - -	0	6	0	£1	0
	Wear and tear of machine, &c.	0	2	6		
Manual Labour.	Twenty-five men, at 2s. each,	2	10	0	2	10
	Wear and tear - - - - - -	0	0	6		

	£	s.	d.
Daily saving - - -	£1	10	0
Supposing a road would require cleaning but twice a week, the yearly saving at this rate would amount to	156	0	0
If but once a week, to - - - - - - - - - - -	78	0	0
On only five miles of road.			

The *sweeping machine*, with the same power and attendants, is capable of cleaning three miles. 20 feet wide, daily.

Manufacture of Gunpowder.—The three ingredients, charcoal, sulphur, and nitre, being prepared, are ready for manufacturing into gunpowder. They are, 1st, Separately ground to a fine powder, which is passed through proper silk sieves or bolting machines; 2nd, They are mixed together in the proper proportions, which we shall afterwards discuss; 3rd, The composition is then sent to the gunpowder mill, which consists of two edge-stones of a calcareous kind, turning by means of a horizontal shaft, on a bed-stone of the same nature; incapable of affording sparks by collision with steel, as sand-stones would do. On this bed-stone, the composition is spread, and moistened with as small a quantity of water as will, in conjunction with the weight of the revolving stones, bring it into a proper body of *cake*, but by no means to a pasty state. The line of contact of the rolling edge-stone is constantly preceded by a hard copper scraper, which goes round with the wheel, regularly collecting the caking-mass, and bringing it into the track of the stone. From fifty to sixty pounds of cake are usually worked at one

* M. Mallat, by an ingenious contrivance, is enabled to make use separately of two kinds of water, sometimes found in a single boring, such as hard and soft water.

operation, under each millstone. When the mass has thus been thoroughly kneaded and incorporated, it is sent to the corning-house, where a separate mill is employed to form the cake into grains or corns. Here it is first pressed into a hard firm mass, then broken into small lumps; after which the corning process is performed, by placing these lumps in sieves, on each of which is laid a disc or flat cake of *lignum vitæ*. The sieves are made of parchment skins, perforated with a multitude of round holes. Several such sieves are fixed in a frame, which, by proper machinery, has such a motion given to it, as to make the *lignum vitæ runner* in each sieve move about with considerable velocity, so as to break down the lumps of the cake, and force its substance through the holes, in grains of certain sizes. These granular particles are afterwards separated from the finer dust by proper sieves and reels. The corned powder must now be hardened, and its rougher angles removed, by causing it to revolve in a close reel or cask turning rapidly round its axis. This vessel resembles somewhat a barrel-churn, and is frequently furnished inside with square bars parallel to its axis, to aid the polish by attrition. The gunpowder is finally dried, which is now done generally with a steam heat, or in some places by transmitting a current of air, previously heated in another chamber, over canvass shelves, covered with the damp grains of gunpowder.—*Dr. Ure, in Journal of Royal Institution.* *See also page 125 of the present volume.*

MISCELLANIES.

LIST OF NEW PATENTS SEALED IN 1830.

Propelling Vessels.—To W. Hale, of Colchester, Essex, for a machine or method of raising or forcing water for propelling vessels.—12th Jan 1830.

Locks.—To J. Carpenter, Willenhall, Stafford, and J. Young Wolverhampton, for improvements on locks.—18th January.

Reciprocating Action.—To W. Parr, of City-road, for a new method of producing or reciprocating action, by means of rotatory motion, to be applied to the working of all kinds of pumps, mangles, &c.—18th Jan.

Machinery.—To E. Dakeyne, and J. Dakeyne, Derby, for a machine or hydraulic engine for applying the power of pressure of water, steam, and other elastic fluids, to work machinery, &c. 21st January.

Pump.—To G. Vangham, of Cleveland-Street, Mile End Road, for a machine or pump for raising water or other fluids.—23rd January.

Cotton &c.—To John Yates, of Hyde, Chester, for a method or process of giving a metallic surface to cotton, silk, linen, &c.—26th Jan.

Cocks.—To G. Stocker and A. Stocker, Yeovil, Somerset, Gunsmiths, for a cock for drawing liquor from casks.—26th January.

Spring Latch, &c.—To J. Arnold, of Sheffield, York, for an improved spring latch or fastening for doors.—26th January

Carriage Wheels.—To G. F. Johnson, of Canterbury, for a machine or apparatus, as a substitute for drags for carriage wheels &c.—26th January.

Candles.—To T. Bulkeley, of Richmond, Surrey, Doctor, of Physic, for a method of making or manufacturing candles.—26th January.

Skaits.—To J. Cobbing, of Bury St. Edmonds, for improvements on Skaits.—26th January.

Tiles, Bricks, &c.—To S. Wright, of Shelton, Staffordshire Potteries, for manufacture of ornamental tiles, bricks, and quarries, for floors, pavements, &c.—26th January.

Distilling and Rectifying.—To R. Busk, of Leeds, York, Gent. for improvements in apparatus used for distilling and rectifying.—26th Jan.

Sheathing of Ships.—To J. Revere, of New York United States, of America, but now of St. James', Westminster, M.D., for a new alloy or compound metal for sheathing ships, &c.—28th January.

Iron.—To Josias Lambert, of Liverpool Street, London, Esq. for an improvement in the process of making iron applicable at the smelting of the ore, &c.—4th February.

Globes—To G. Pocock, of Bristol, Gentleman, for improvements in making or constructing astronomical and geographical globes.—4th Feb.

Coppering Ships.—To J. Gray, of Beaumoris, Anglesea, for a new and improved method of preparing and putting on copper sheathing for shipping.—4th February.

Candles.—To C. T. Miller, of Piccadilly, Middlesex, for an improvement in making Candles.—4th February.

Manufacturing Woollen Cloths.—To J. C. Daniell, of Limphey Stoke, Wilts, for improvements in machinery for manufacturing woollen cloths.—6th February.

Cleansing Rough Rice.—To M. Wilson, Warnford Court, London, for an improved method of cleaning rough rice.—6th February.

Weaving Wire.—To T. R. Williams, of Nelson Square, Surrey, Esq. for improvements in power looms for weaving wire.—6th February.

Making Gas.—To E. Cowper. of Streatham Place, Surrey, for improvements in making gas.—12th February.

Preparing Piece Goods.—To J. F. Smith, of Dunstan Hall, Chesterfield, Derby, for improvements in preparing piece goods.—12th Feb.

Dye Woods.—To J. M. C. La Rigandelle du Buisson, of Fenchurch Street, London, for extracting dye from dye woods.—12th February.

Salt.—To J. Braithwaite and J. Ericsson, of the New Road, Middlesex, for an improved method of manufacturing salt.—27th February.

Cocks.—To Enoch W. Rudder and R. Martineau, of Birmingham, Warwick, for certain improvements in cocks for draining off liquids.—27th February.

Fire-Arms.—To C. R. Baron de Berenger, of St. Pancras, Middlesex, for improvements in fire-arms, &c.—27th February.

Wheeled Carriages.—To W. Grisenthwaite, of Nottingham, for improvements in the draught or propulsion of wheeled carriages.—27th February.

Woollen Cloth.—To H. Hirst, of Leeds, York, for improvements in manufacturing woollen cloth.—27th February.

Springs.—To M. Poole of Lincoln's Inn, for a certain combination of, or improvements in, springs applicable to carriages and other purposes.—27th February.

Rovings of Cotton, Flax, Wool, &c.—To J. Chesseborough Dyer, of Manchester, for certain improvements on, and additions to, machines or machinery to be used and applied for conducting to, and winding upon, pools, bobbins, or barrels, rovings of cotton, flax, wool, &c.—27th Feb.

Steam Engines.—To W. Grisenthwaite, of Nottingham, for improvements in steam-engines.—27th February.

Rudders.—To R. W. Sievier, of Southampton Row, Russel Square, Middlesex, for improvements in the construction of rudders in navigating vessels.—27th February.

Piano Fortes.—To S. Thompson, of Great Yarmouth, Norfolk, for improvements in piano-fortes.—27th February.

Wheels for Carriages.—To W. Howard, of Rotherhithe, Surrey, for improvements in the construction of wheels for carriages.—27th February.

Masts.—To P. C. de le Garde, Exeter, for improvements in apparatus for fidding and unfidding masts, and in masting and rigging of vessels.—27th February.

Window Sashes.—To T. Prosser, Worcester, for improvements in window Sashes, &c.—6th March.

Sugar.—To T. R. Guppy, Bristol, for a new apparatus for granulating sugar.—6th March.

Quarries, Bricks, Tiles, &c.—To R. Stevenson, of Colridge, for improvements in machinery for making quarries, bricks, tiles, &c.—6th March.

Canvass and Sail Cloth.—To J. Ramsay and A. Ramsay, of Greenoch, North Britain, and M. Orr, of Greenoch, for an improvement in the manufacture of canvass and sail cloth.—20th March.

Windlasses.—To G. Scott, of Water Lane, London, for improvements to windlasses, &c.—20th March.

Pepper.—To J. A. Fulton, of Lawrance Pountney Lane, Cannon Street, London, for an improvement in the preparation of pepper.—20th March.

Cooking Apparatus.—To W. E. Cochrane, of Regent Street, Middlesex, for an improvement on his patent cooking apparatus.—20 March.

Improved Guards or Protectors.—To B. Rotch, of Furnival's Inn, Middlesex, for improved guards or protections for horses' legs and feet.—20th March.

Steam Boilers.—To J. Rawe, Jun. and J. Boase, of Albany Street, Regent's Park, Middlesex, for improvements in steam-boilers.—30th March.

Beer, Ale, &c.—To W. Aitkin, of Carron Vale, Scotland, for improvements in the means of keeping or preserving beer, ale, and other fermented liquors.—30th March.

Distilling and Rectifying.—To D. Towers Shears, of Bankside Southwark, for additions to and improvements in the apparatus used in distilling, &c.—31st March.

Gas. To J. Collier, of Newman Street, Oxford, Street, St. Mary-le-bone, and H. Pinkus, of Thayer Street, Manchester Square, for an improved method and apparatus for generating gas for illumination.—5th April.

Steam Engine, &c.—To W. A. Summers, of St. George's Place, St. George's in the East, Middlesex, and N. Ogle, Millbrook, Hants, for improvements in the construction of steam-engine and other boilers or generators applicable to propelling vessels, locomotive carriages, &c.—13th April.

Pens.—To J. Perry, of Red Lion Square, Holborn, Bookseller, for an improvement or improvements in or on pens.—24th April.

British Tapioca.—To J. M'Innes, of Auchenreoch, and of Woodburn,

North Britain, for the manufacture or preparation of the British Tapioca. 24th April.

Bolts and Chains.—To S. Brown of Billiter Square, London, R. N. for improvements in making or manufacturing bolts and chains.—24th April.

Steam Boilers.—To J. Cochaux, of Fenchurch Street, London, Merchant, for an apparatus to prevent or render less frequent, the explosion of boilers in generating steam.—24th April.

Fuel.—To P. Descroizilles, of Fenchurch Street, London, Chemist, for certain improvements in apparatus for economising fuel in heating water and air.—24th April.

Boats.—To T. Cook, of Blackheath Road, R. N. for improvements in the construction and fitting up of boats.—24th April.

Paper.—To J. Wilks, of Blue Anchor, Bermondsey, for an improvement in the apparatus for making paper by machinery.—28th April.

Ores.—To T. Petherick, of Penfullick, Cornwall, for machinery for separating copper, lead, and other ores, from earthy and other substances.—28th April.

Cocks.—To J. Walker, of Weymouth, Middlesex, for an improved cock for fluids. 4th May.

Bricks.—To H. R. S. Devenoge, of Little Stanhope Street, May Fair, for improvements of machinery for making bricks.—8th May.

Calico Printing.—To M. Bush, of Dalnornach, Print Field, near Bonhill, by Dumbarton, North Britain, for improvements in machinery or apparatus for printing calicoes and other fabrics—24th May.

Corks and Bungs. To J. Holmes Bass, of Hatton Garden, London, for improvements in machinery for cutting corks and bungs.—3rd June.

Lace—To J. Levers, of New Radford Works, near Nottingham, for improvements in machinery for making bobbin net.—8th June.

Excavation of Earth. To G. Vaughan Palmer, of Worcester, for a machine to cut and excavate earth.—June 8th.

Steam Engines.—To W. T. Haycraft, of Greenwich, for improvements in steam engines.—11th June.

Mechanical Power.—To T. Brunton and T. J. Fuller, of Commercial Road, Limehouse, for an improved mechanical power applicable to machinery of different descriptions.—19th June.

Baking.—To R. Hicks, Conduit Street, Hanover Square, surgeon, for an economical apparatus or machine to be applied in the process of baking, for the purpose of saving materials.—29th June.

Sugar. To E. Turner, Gower Street, Middlesex, M.D. and W. Shand, of the Burn in Kincardineshire, for a new method of purifying and whitening sugar or other saccharine matter.—29th June.

Sugar.—To M. Poole, Lincoln's Inn, gentleman for certain improvements in the apparatus used for certain processes of extracting molasses or syrup from sugar.—29th June.

Chemical Agents.—To S. Parker, Argyle Street, Oxford Street, bronzist, for certain improvements in producing the mechanical power from Chemical agents—29th June.

Lamps.—To S. Parker, Argyle Street, Oxford Street, bronzist, for an improved Lamp.—29th June.

Cotton.—To R. Roberts, Manchester, civil engineer, for improvements in spinning cotton and other fibrous substances.—1st July.

Locomotive Machinery.—To J. H. Clive, Chell House, Staffordshire, for

improvements in the construction of and machinery for locomotive ploughs, harrows, and other machines and carriages.—1st July.

Looms.—To. J. H. Sadler, Praed Street, Paddington, for improvements in looms.—1st July.

Sheathing Ships.—To M. Uzielli, Clifton Street, Finsbury Square, for improvements in the preparation of certain metallic substances, and the application thereof to the sheathing of ships and other purposes.—6th July.

Bits.—To J. Surman, Hounslow Barracks, Middlesex, lieutenant, and riding-master in the Tenth Hussars, for improvements on bits for horses and other animals.—6th July.

Mills.—To W. W. Tuxford, Boston, Lincolnshire, miller, for a machine or apparatus for cleansing or purifying wheat, grain or other substances.—6th July.

Printing.—To Edw. Cowper, Streatham place, Surrey, and Eben. Cowper, of Suffolk Street, Pall Mall East, Westminster, engineers, for improvements in printing-machines.—19th July.

Steam Carriages.—To J. Rawe, Junior, and J. Boase, Albany Street, Regent's Park, for improvements in steam carriages and in boilers, and a method of producing increase of draft.—19th July.

Steam.—To T. Bulkeley, Albany Street, Regent's Park Middlesex, M.D. for certain improvements in propelling vessels, which improvements are also applicable to other purposes.—19th July.

Steam.—To W. Taylor, Wednesbury, Staffordshire, engineer, for certain improvements on boilers and apparatus connected therewith, applicable to steam-engines and other purposes.—19th July.

Fermentation.—To E. Riley, of Skinner Street, Bishopsgate Street, for improvements in fermenting malt and other liquors.—19th July.

Shearing.—To G. Oldland, of Hillsley, Gloucestershire, for improvements in the machinery or apparatus for shearing and dressing woollen cloths and other fabrics.—22nd July.

Power.—To J. Ericsson, of the New Road, for an improved engine for communicating power for mechanical purposes.

Sugar.—To A. Garnett, of Demerara, for certain improvements in manufacturing sugar.—24th July.

Plating.—To S. Roberts, of Park Grange, near Sheffield, Yorkshire, for improvements in plating or coating of copper or brass, as also a method of making such kinds of articles or utensils with the said metal, when so plated.—26th July.

Paper. To R. Ibotson, of Poyle, Middlesex, for an improvement in the method or apparatus for separating the knots for paper stuff or pulp, used in the manufacture of paper.—29th July.

Propelling Machinery.—To J. Ruthven, of Edinburgh, for an improved machinery for the navigating of vessels and propelling of carriages.—5th August.

Gas.—To J. Down, of Leicester, for improvements in making gas for illumination, and in the apparatus for the same.—5th August.

Rotary Motion.—To J. Street, of Clifton, Gloucestershire, for a new mode of obtaining a rotary motion by water, steam, or gas, or other vapour; being applicable to the giving blasts to furnaces, forges, and other purposes where a constant blast is required.—5th August.

Safety Boat.—To W. Dobree, of Fulham, for an independent safety boat of novel construction.—5th August.

Roving Frames.—To W. Lane, of Stockport, Chester, for improve-

ments in roving frames, or otherwise called cove frames, or bobbin and fly frames, or jack frames.—5th August.

Wearing Apparel.—To T. Hancock, of Goswell Road, for improvements in the manufacture of wearing apparel, fancy ornaments, or figures.—5th August.

Wheel Barrows.—To W. Mallet, of Marlborough Street, Dublin, for improvements in making or constructing certain descriptions of wheelbarrows.—5th August.

Wheels.—To J. Pearse, of Tavistock, Devon, for an improved method of making and constructing carriage wheels, and in the application thereof to carriages.—5th August.

Rice.—To C. Shiels, of Liverpool, for improvements in the process of preparing and cleansing rice.—5th August.

Brewing, &c.—To Æ. Coffey, of the Dock Distillery, Dublin, for improvements in the apparatus or machinery used in brewing and distilling.—5th August.

Sugar.—To M. Robinson, of Great George Street, Westminster, for improvements in making and purifying sugars.—5th August.

Block Making.—To R. Clough, of Liverpool, for an improved supporting block, to be used in graving docks, and for other purposes.—5th August.

Packing.—To Sir C. Webb Dance, of Hertsbourne, for improvements in packing and transporting goods.—5th August.

Touch Holes.—To S. Smith, of Princes Street, Leicester Fields, for a new nipple or touch hole, to be applied to fire arms for the purpose of firing the same by percussion; and a new cap or primer for containing the priming, by which such fire arms are to be fired.—7th August.

Candles.—To W. Palmer, of Wilson Street, Finsbury Square, for improvements in making candles.—10th August.

Saddles.—To J. Lawrence, of Birmingham, and W. Rudder, of Edge, Gloucestershire, for an improvement in saddles and girths by an apparatus affixed to either of them.—10th August.

Medicine.—To T. Ford, of Canonbury Square, Islington, for improvements in the medicine for the cure of coughs, colds, asthmas, and consumptions, known by the name of "Ford's Balsam of Horehound."—12th August.

Hop Pole Machine.—To J. Knowles, of Farnham, Surrey, for a certain instrument or machine for drawing up hop poles out of the ground, previous to picking the hops; and which, by drawing the poles perpendicularly, will greatly save them, as well as prevent the hops from being bruised, called "a hop pole drawer by lever and fulcrum."

Paper.—To M. Towgood, of Dartford, Kent, and L. Smith, of Paternoster Row, London, for an improved mode of applying size to paper.—18th August.

Propelling Machinery.—To Major General Gubbins, of Southampton, for improvements in propelling and giving motion to machinery.—18th August.

Brick-Making.—To S. R. Bakewell, of Whiskin Street, Clerkenwell, for improvements in machinery, apparatus, or implements in the manufacture of bricks, tiles, and other articles to be formed or made of clay, or other plastic materials.—18th August.

Axletrees.—To W. Mason, of Margaret Street, Cavendish Square, for improvements in axletrees and their boxes.—24th August.

Paper Making.—To T. Barratt, of St. Mary Cray, Kent, for improvements on machinery for making paper.—31st August.

Printing.—To A. Applegath, of Crayford, Kent, Printer, for improvements in printing machines.—31st August.

Railways.—To W. Losh, of Benton House, Northumberland, for improvements in wheels for railway carriages.—31st August.

Mowing.—To E. Budding, of Stroud, Gloucestershire, for machinery for cropping or shearing grass plats, &c.; being a substitute for the scythe.—31st August.

Bread.—E. Clayton, of Nottingham, for an improved mode of manufacturing dough for baking into bread.—31st August.

Saddle.—To T. Thackery of Birmingham, for an elastic self-adapting saddle.—7th September.

Locomotion.—To J. Hanson, of Huddersfield, Yorkshire, for improvements on locomotive carriages.—31st August.

Carriages.—To P. Williams, of Holywell, Flintshire, for an apparatus, for preventing accidents in carriages, instantly liberating horses from the same, and locking the wheels, &c.—7th September.

Locomotion.—To C. B. Vignoles, of Furnivals Inn, London, and J. Ericsson, of Brook Street, Fitzroy Square, for additions to the engines commonly called locomotive engines.—7th September.

Cocks.—To W. Cook, of Redcross Square, Cripplegate, for improvements on cocks.—7th September.

Fids.—To H. G. Pearce, R. Gardner and J. Gardner, of Liverpool, for an improved fid.—7th September.

Building.—To J. Chadley, of Gloucester Street, Queen Square, for improvements in making bricks, tiles, and chimney bars. 13th Sept.

Chimneys.—To S. Smith, of Wilton Crescent, Hanover Square, for improvements in chimneys.—14th September.

Boats.—To W. Church, of Haywood House, Birdsley Green, near Birmingham, for improvements in the construction of boats and other vessels, a part of which improvements are applicable to the construction of carriages.—21st September.

Silk.—To F. Molyneux, of Hampstead, and W. Bundy, of Kentish Town, for improvements in machinery for spinning and twisting silk, wool, and for roving, spinning, and twisting cotton, flax, hemp, and other fibrous substances.—21st September.

Glazing.—To J. Harrison, and R. G. Curtis, of Wortley Hall, York, for improvements in glazing horticultural and other buildings, and in sash bars and rafters.—6th October.

Sugar.—To C. Derosne, of Leicester Square, for improvements in extracting sugar or syrups from cane-juice and other substances containing sugar; and in refining sugar and syrups.—29th September.

Gas.—To M. Donovan, of Dublin, for an improved method of lighting places with gas.—6th October.

Fire Escape.—To Lieut. Col. L. Walker, C. B. of Cumming Street, Pentonville, for a machine or apparatus to effect the escape and preservation of persons and property in case of fire.—6th October.

Anchors.—To R. Perring, of Exmouth, Esq. for an improvement on anchors.—6th October.

Propelling Machinery.—To J. Heaton, W. Heaton, G. Heaton, and R. Heaton, of Birmingham, for certain machinery, and the application thereof, to steam engines, for the purpose of propelling and drawing carriages on turnpike roads, and other roads and railways.—6th October.

Paper.—To J. Dickinson, of Nash Mill, Herts. Esq. for an improved method of manufacturing paper by machinery.—6th October.

Sugars.—To W. A. Archbald, of Vere Street, Cavendish Square, for an improvement in the preparing or making of certain sugars.—13th Oct.

Printing.—To D. Napier, of Warren Street, Fitzroy Square, for improvements in printing and in pressing machinery.—13th October.

Tanning.—To F. C. Jaquemart, of Leicester Square, for improvements in tanning certain descriptions of skins.—20th October.

Evaporation.—To J. B. Sharp, of Hampstead, Esq. and W. Fawcett, of Liverpool, for an improved mode of introducing air into fluids for the purpose of evaporation.—20th October.

Veneers.—To A. Craig, of Ann Street, Saint Bernard's, in the county of Mid Lothian, for improvements in machines or machinery for cutting timber into veneers or other useful forms.—20th October.

Distillation.—To A. Ure, of Burton Crescent, Middlesex, for an apparatus for regulating temperature in evaporization, distillation, and other processes.—20th October.

Sugar.—To A. Ure, of Burton Crescent, Middlesex, for an improvement in curing or cleansing raw or course sugar.—20th October.

Air Stoves.—To A. Ure, of Southampton Row, Middlesex, for an air-stove apparatus for the exhalation and condensation of vapours.—20th Oct.

Saddle Cloth and Girths.—To S. Clark, of South Down, Brixham, Devon, for improvements in making or preparing saddle-cloths and girths, for keeping saddles in place on horses and other animals of burthen. 20th Oct.

Excavations.—To Sir T. Cochrane, Knight, (commonly called Lord Cochrane), of Regent Street, for his invented apparatus to facilitate excavating, sinking, and mining.—20th October.

Brushes.—To T. Mason, of Great Portland Street, Middlesex, for an improvement in the manufacture of painting brushes, and other brushes applicable to various purposes.—20th October.

Gas Meters.—To. S. Clegg, of Sidmouth Street, Gray's Inn Lane, for an improved gas-meter.—20th October.

Saddles.—To H. Calvert of Lincoln, for an improvement in making saddles by their slipping forward — 26th October.

Hooks.—To J. Shores, of Blackwall, Middlesex, for an improvement on tackle and other hooks.—1st November.

Rudders.—To J. Collinge, of Lambeth Surrey, for an improvement on the apparatus used for hanging or suspending the rudders of ships or vessels of different descriptions.—1st November.

Nebs.—To B. Cook, of Birmingham, for an improved method of making a neb or nebs, slot or slots, in shells or hollow cylinders of copper, brass, or other metals, for printing calicoes, muslins, cloths, &c.—1st November.

Cutting Paper.—To L. Aubrey, of Two Waters, Herts, for improvements in cutting paper.—1st November.

Dyeing.—To J. Bowler, of Castle Street, Southwark, for improvements in machinery employed in dyeing hats.—1st November.

Furnaces.—To J. Nott, Shenectady, in the State of New York, but now of Bury Street, St. James's Middlesex, Esq. for improvements in the construction of Furnaces, &c.—4th Nov.

Locomotion.—To. T. Bramley, and R. Parker, both of Moulsey Priory Surrey, for improvements on locomotive carriages, &c. applicable to Rail and other roads.—4th Nov.

Wool.—To. A Bell, of Chapel Place, Southwark for improvements in machinery for removing wool or hairs from skins.—4th November.

Wheels.—To A. W. Gillett, of Birmingham, Warwick, for improvements in the construction and application of wheels to carriages, &c.—4th November.

Metals—To G. Bompas of Fishponds, near Bristol, M.D. for a method of preserving copper and other metals from corrosion or oxidation.—4th November.

Fluids.—To J. Gibbs, of Crayford, Kent, Esq. for improvements in evaporating fluids applicable to various purposes.—6th November.

Paper.—To J. Hall, the younger, of Dartford, Kent, for an improved machine for the manufacture of paper.—9th November.

Chairs.—To G. Minter, of Princes Street, Soho, Middlesex, for an improvement in the construction of chairs.—9th November.

Quarries.—To H. Pratt, of Bilston, Stafford, for improvements in the manufacturing of quarries.—11th November.

Rotary Engine.—To Sir T. Cochrane, Knt. of Regent Street, for an improved rotary engine, to be impelled by steam, and which may be also rendered applicable to other purposes.—11th November.

Spinning.—To C. S. Cochrane, of Great George Street, Westminster, Esq. for improvements in the preparing and spinning of cashmere wool.—13th November.

Arithmetic.—To J. Tyrrell of St. Leonard's Devon, for a method and apparatus of setting sums, for the purpose of teaching some of the rules of arithmetic.—13th November.

Spinning Machinery.—To T. Sands, of Liverpool, for improvements in spinning machines.—18th November.

Anti-Corrosion.—To J. Revere, of Weybridge, Surrey, for an improved method of protecting iron chain cables, iron boilers, and iron tanks from the corrosion produced upon them by the action of water.—27th Nov.

Propelling.—To W. Church, Esq. of Haywood House, Warwick, for improvements in apparatus for propelling boats, &c. and also applicable for evaporation.—29th November.

Calico Printing.—To R. Dalglish, Jun. of Glasgow, for improvements in machinery for printing calicoes and other fabrics.—6th December

Grinding Seeds.—To H. Blundell, Kingston-upon-Hull, for improvements in a machine for grinding or crushing seeds and other oleaginous substances, for the abstracting of oil therefrom, &c.—6th December.

Scouring Paper.—To R. Edwards, of Dewsbury, Yorkshire, for an improvement on or substitute for glass, sand, emery, and other scouring paper.—6th December.

Mooring Ships.—To S. Brown,, of Billiter Square, London, for improvements in the means of drawing up ships and other vessels from the water on land, and for transporting or mooring ships, vessels, or other bodies on land from one place to another.—6th December.

Fire Arms.—To. J. G. Lacy, of Camomile Street, and S. Davis, of East Smithfield, London, for improvements in the construction of guns and fire arms.—6th December.

Cocks, &c.—To J. Dixon, and J. Vardy, of Wolverhampton, for improvements in cocks for drawing off liquids.—13th December.

Cottons, &c.—To T. Walmsley, of Manchester, for improvements in the manufacture of cotton, linen, silk, and other fibrous substances.—13th December.

Spinning.—To W. Needham, of Longour, Staffordshire, for improve-

ments in machinery for spinning, doubling, and twisting *silk, and other* fibrous substances.—13th December.

Lamps.—To S. Parlour, of Croydon, Surrey, for improvements on lamps.—13th December,

Baths.—To J. L. Benham, of Wigmore Street, London, for improvements in shower and other baths.—13th December.

Propelling.—To R. Witty, of Basford, Staffordshire, for improvements for propelling carriages, vessels, &c. by steam.—13th December.

Locks and Triggers.—To B. Redfern, of Birmingham, Warwickshire, for a lock-break-off and trigger upon a new and improved principle, for fowling-pieces, muskets, &c.—17th December.

Springs.—To A. Graham, of West Street, Finsbury, London, for improvements in the application of springs for carriages.—17th December.

Woollen Cloths.—To Daniel Papps, of Stanley End, Machine Maker, for improvements in machinery for dressing or roughing woollen cloths.—23rd December.

Coal Mines.—To W. Wood, of Summer Hill, Northumberland, for the application of a battering ram in working coal in mines.—23rd Decemb.

Sugar.—To M. E. A. Pertius, of No. 56, Rue du Bac, Paris, Spinster, for the fabrication or preparation of a coal fitted for refining and purifying sugar, &c.—23rd December.

Woollen Cloths.—To J. Ferrabee, of the Thrupp Mill and Foundry, in Stroud, Gloucester, for improvements in machinery for preparing the pile or face of woollen or other cloths.—23rd December.

EXPEDITIONS OF DISCOVERY.

Amsterdam and St. Petersburg.—A regular communication is now established between Amsterdam and St. Petersburg. A steam-boat takes the traveller to Hamburg, when a stage coach awaits for Lubeck, from whence another steam-boat carries him to the Russian capital. The distance from Paris is 580 leagues, and the journey is accomplished in ten days. Equally regular communications have also been established between Stockholm and Copenhagen.

Intelligence of Captain Ross, R.N.—Two accounts of the progress of Captain Ross's exploratory voyage have reached us. We give them as communicated to us. According to one account, Captain Ross was met with in Baffin's Bay, in August 1829, where having suffered damage during hard weather, he fortunately was enabled, from the wreck of a Greenland ship to refit. He afterwards steered northward, and has not since been heard of. The other account represents our adventurous commander and his brave crew as having been forced back to Lively Bay, in Baffin's Bay, where they spent last winter.—*Ed. New Phil. Journ.* Jan. 1831.

Mr. Holman the Blind Traveller.—This gentleman after visiting Ceylon, Madras and other parts of India, where he experienced the utmost attention, left Calcutta, (where he remained only a few days, during which Lord William Bentinck treated him with great courtesy and kindness) in August, for China. On his return from China, he proposes to visit New South Wales, and to continue his travels for two years longer.—*Asiatic Journal.*

Scientific Expedition in the Asiatic Provinces, lately conquered by Russia.— An imperial librarian has been sent, with naturalists and artists, into the Turkish countries conquered by the Russian army during the late war, to collect geographical documents, and to copy the most remarkable inscriptions and monuments. The winter before, an antiquary had been sent to Odessa in search of antiquities, along the banks of the Danube as far as Sizeboli.—*Bull. de la Soc. de Geog.*

Assassination of Dr. Schulz.— A letter from Tiflis, of the 1st March, announces the assassination of Dr. Schulz, professor of the University of Giessen, who had been sent out at the expense of the King of France to visit Asiatic Turkey and Persia for scientific and literary purposes. —*Edinburgh Journal.*

Route from India by Egypt.—Mr. Waghorn has returned from India. This enterprising officer has ascertained that the route by Trieste, Alexandria, and the Red Sea, to Bombay, is, with certain precautions, perfectly practicable; and that the navigation of the Red Sea presents no danger nor difficulty.—*Asiatic Journal*

Australasia.—Mr. Frazer, the colonial botanist, gives the most flattering account of the river Brisbane and the country in the neighbourhood of Moreton Bay, the rivers, plains, creeks, forests, mountains, and valleys, assuming an appearance of extent and grandeur unknown in any other part of the coast as yet discovered. Hitherto all our colonial rivers and rich alluvial countries have been found merely on a small scale, but every thing at Moreton Bay assumes a vastness and importance quite unrivalled; and we are glad to hear that Mr. Frazer, who is well entitled to an opinion on the subject, gives Moreton Bay a decided preference over the boasted Swan River.—*Australian.*

Van Dieman's Land.— Coal has been found here, most nearly resembling Elgin Wall End, which has long been held in high estimation for the purposes of steam navigation.—*Asiatic Journal.*

Messrs. Richard and John Lander have sailed from Spithead for the western coast of Africa. They took with them instructions from the Secretary of State, addressed to the captain of the first King's ship they chanced to meet, after leaving Cape Coast Castle, and directing him to convey them to Badagry, where he or his officers were to introduce them in the name of our Sovereign to the King of that country, Adolee by name. They were to proceed thence to Katunga, the capital of Yarlba, from thence to Boussa (where Mungo Park was lost), with a view to trace the river Niger to its termination. If the river should be found to flow into the Bight of Benin, the young men were to return by that route; if, on the contrary, it should be found to flow to the eastward, into the Lake of Ischadan Bornou, they were to return over the Great Desert to Tripoli, by way of Fezzan.

Swan River.—Various and conflicting statements have been received from this colony throughout the year. From the most recent, in the *Literary Gazette*, date October 4, 1830, we quote the following:—An Ensign of the 63rd regiment (a Mr. Dale) has lately returned from a tour of discovery into the interior, and has brought intelligence, that to the eastward of the Swan River there is a large and fertile tract of beautiful country, with a river passing through it, which is likely to prove of the greatest importance to the colony. Those of the settlers who have not taken up their grants of land mean to secure them here. We may add

the difficulties and embarrassments which the settlers at the Swan River have been obliged to endure, have been industriously exaggerated by the colonial press; the strong desire which exists in New South Wales to attract emigrants to that country being naturally allied with a disposition to disparage every other settlement.

Egyptian Geography.—Mr. Wilkinson, who for many years has carried on his scientific researches in Egypt, has completed an elaborate map of the *Feioom,* and thus supplied what has hitherto remained a desideratum in the delineation of Egypt. The map has been printed from stone, at Cairo, for private circulation among his friends.

Messrs. Cowie and Green's Papers.—It is gratifying to learn that there is every likelihood of the papers of Messrs. Cowie and Green, the gentlemen who perished during an expedition to Delagoa Bay, in Southern Africa, in 1828-9, being eventually published. The MSS. abound with details of natural history as well as geography.

The American papers contain an official notice in regard to the Tortugas, a cluster of petty islands, or rather shoals, not far from the south point of Florida. Their whole length is about ten miles. Their surface is in general covered with bushes, but, being low and without any prominent feature, cannot at present be discerned at a greater distance than ten miles. On this spot, which is within the territory of the United States, Government have it in contemplation to establish a naval depot, which would give security to merchantmen engaged in the West India trade, and a retreat for invalids in the sickly season. It would also overawe the pirates who issue from the adjacent harbours.

New Islands in the Pacific.—The Journals of the United States have recently published the following details, which have been furnished by Capt. Daniel Mackenzie, commanding the *Minerva Smith,* in which he made a long voyage, during the years 1828 and 1829. On the 1st December 1828, Capt. Mackenzie discovered, in the Pacific Ocean, an island which he named *Howland,* situated under 176 deg. 49 min. 30 sec. W. long. (from Greenwich), and 45 miles from the Equator, north lat. It is about 10 miles in circumference; the soil is low and well wooded, but he could find no anchorage. The island showed no trace of inhabitants, and did not appear to have been visited by any previous navigator, the waters of the coast abound with excellent fish. The Captain also affirmed that the island called *New Nantucket,* is nothing but a bar or bank of sand, situated 14 miles from the equator, in north latitude, and about 179 deg. 33 min. 15 sec. longitude west of Greenwich. On the 13th of the same month of December, he discovered that the group of islands known by the name of *King's Mill,* is placed in all the maps 84 miles east of its true position. *Dundas,* marked upon the maps at 9 miles from the equator, south latitude, is, on the contrary, in 9 miles north latitude. On the 27th February 1829, he perceived another group of islands, entirely covered with wood and cocoa trees. Some natives brought to them 170 cocoa nuts, which they exchanged for pieces of iron hoops. These people were entirely naked, and wore tortoise-shell ornaments suspended from their noses. The situation of this group, which is thought to be a continuation of Lord Howe's Islands, was determined, after many observations, to be 4 deg. 24 min. south latitude, and 158 deg. 45 min. 15 sec. east longitude, from Greenwich.—*Bull. de la Soc. de Geographie.*

Survey of the Coast of South America.—The Adventure and Beagle,

Captain King, are returned to this country. These vessels left England on this service in 1826, and have completed the survey from the Gulf of St. George on the Atlantic, to the Gulf of Penas on the Pacific side of the continent, including the Archipelago of islands called Terra del Fuego, and those of the S.W. coast. The expedition has been most fortunate in its observations and collections. Capt. King, it is understood, will be sent out again to continue his survey from Cape Horn to the Rio de la Plata.

Voyage to the Russian Colonies in America; Discovery of an Inhabited Island.—M. Khromtchénks, during his voyage, which has occupied nearly two years, and on his return from which he arrived at Cronstadt in July last, has discovered in 76 deg. 9 min. 36 sec. N. lat. and 177 deg. 15 sec. E. long. of Greenwich, a small inhabited island, which is not marked on any of the most recent maps. M. Khromtchénks gave it the name of *Lawendahl*, in honour of his first lieutenant. This traveller has also determined the position of two groups of islands, (of which Kotzebue only spoke from the narrative of an islander), and he has given a description of them.—*Revue. Encyc.*

Exact Measure of a Degree.—Ten thousand rubles (upwards of £1,500 a year!) have been granted by the Emperor of Russia, for the continuation of the investigations undertaken to obtain the exact measure of the degree. This work, which it is said will last for ten years, is confided to the charge of M. Struve of Dorpat. Two staff-officers, natives of Finland, Messrs. Rosenius and Aberg, are already gone to their country for the purpose of discovering the mathematical points of union between Hochland and Tornea. M. Struve has projected a journey abroad, in furtherance of this great undertaking.—*Bull. de la Soc. de Geog.*

The London Geographical Society has been formed within the past year. The objects are stated to be

1. To collect, register, and digest, and to print for the use of the members, and the public at large, in a cheap form and at certain intervals, such new, interesting, and useful facts and discoveries, as the Society may have in its possession, and may from time to time, acquire.

2. To accumulate gradually a library of the best books on Geography, a selection of the best voyages and travels—a complete collection of maps and charts, from the earliest period of rude geographical delineations, to the most approved of the present time; as well as all such documents and materials as may convey the best information to persons intending to visit foreign countries; it being of the greatest utility to a traveller to be aware, previously to his setting out, of what has been already done, and what is still wanting, in the countries he may intend to visit.

3. To procure specimens of such instruments as experience has shown to be most useful, and best adapted to the compendious stock of a traveller, by consulting which, he may make himself familiar with their use.

4. To prepare brief instructions for such as are setting out on their travels; pointing out the parts most desirable to be visited; the best and most practicable means of proceeding thither; the researches most essential to make; phenomena to be observed; the subjects of natural history most desirable to be procured; and to obtain all such information as may tend to the extension of our geographical knowledge. And it is hoped that the Society may ultimately be enabled, from its funds, to

render pecuniary assistance to such travellers as may require it, in order to facilitate the attainment of some particular object of research.

5. To correspond with similar societies that may be established in different parts of the world; with foreign individuals engaged in geographical pursuits, and with the most intelligent British residents in the various remote settlements of the empire.

6. To open a communication with all those philosophical and literary societies with which geography is connected; for as all are fellow-labourers in the diffierent departments of the same vineyard, their united efforts cannot fail mutually to assist each other.

7. And lastly. In order to induce men of eminence and ability in every branch of science, literature, and the arts, and in particular those who have travelled by sea and by land, and all such as are skilled in geographical knowledge, and likely to become useful and efficient members, it was suggested that the admission fee and annual contribution should be on as moderate a scale as, with the number of subscribers calculated upon, would be sufficient to enable the Society to fulfil the important objects herein alluded to.

The following points may also be briefly stated, as being among the most important that will probably engage the attention of the Society:

1. The composition of maps, illustrative of particular branches of geographical knowledge, more especially those relating to orology, hydrology, and geology.

2. The establishment of new divisions of the earth's surface, formed upon philosophical principles, and adapted to different departments of science; more especially as regards those divisions which are founded on physical and geological characters, on climate, and on distinctions of the human race, or of language.

3. A more uniform and systematic orthography than has hitherto been observed, in regard to the names of cities and other objects; and a more precise and copious vocabulary, than we at present possess, of such objects.

4. The preparation and improvement of road-books for different countries, of gazetteers, and of geographical and statistical tables, and all such matters as are of general utility.

CALENDAR OF THE MEETINGS OF THE SCIENTIFIC BODIES OF LONDON FOR 1830–31.

SOCIETIES.	TIME OF MEETING.	NOVEMBER.	DECEM.	JAN.	FEBRUARY.	MARCH.	APRIL.	MAY.	JUNE.
Royal - - - *Somerset House.*	Thur. 8½ P.M.	18, 25, 30*	9, 16, 23	13, 20, 27	3, 10, 17, 24	3, 10, 17, 24	14, 21, 28	5, 12, 19	2, 9, 16
Antiquaries - *Somerset House.*	Thur. 8 P.M.	18, 25	2, 9, 16, 23	13, 20, 27	3, 10, 17, 24	3, 10, 17, 24	14, 23,* 28	5, 12, 19	2, 9, 16
Linnean - - *Soho Square.*	Tues. 8 P.M.	2, 16	7, 21	18	1, 15	1, 15	5, 19	3, 24*	7, 21
Horticultural - *Regent Street.*	Tues. 1 P.M.	2, 16	7, 21	4, 18	1, 15	1, 15	5, 19	2,* 3, 17	7, 21
Society of Arts *Adelphi.*	Wed. [illegible] P.M.	3, 10, 17, 24	1, 8, 15, 22	12, 19, 26	2, 9, 16, [illegible]	2, 9, 16, 23, 30	6, 13, 20, 27	4, 11, 18, 25	[illegible], 8
Royal Society of Literature *Parliament St.*	Wed. 3 P.M.	3, 17	1, 15	5, 19	2, 16	2, 16	6, 20, 28*	4, 18	1, 15
Geological - *Somerset House.*	Wed. 8½ P.M.	3, 17	1, 15	5, 19	2, 16, 18*	2, 16, 30	13, 27	11, 25	8, 22
Zoological Society - - *Bruton Street*	Thur. 3 P.M.	4	2	6	3	3	7, 29*	5	2
Astronomical - *Lincoln's Inn Fds.*	Fri. 8 P.M.	12	10	14	11*	11	8	13	10
Royal Institution *Albemarle St.*	Fri. 8½ P.M.	..	..	21, 28	4, 11, 18, 2[illegible]	4, 11, 18, 25	15, 22, 29	2,* 6, 13, 20, 27	3, 10
Royal Asiatic - *Grafton Street.*	Sat. 2 P.M.	..	4, 18	1, 15	5, 19	5, 19	16	7	7,* 18 July 2, 16

* ANNIVERSARIES.—Royal Society, Nov. 30, 11 A.M.—Astronomical, Feb. 11, 3 P.M.—Geological, Feb. 18, 1 P.M.—Antiquaries, April 23, 2 P.M.—Royal Society of Literature, April 28.—Zoological Society, April 29, 1 P.M.—Royal Institution, May 2.—Horticultural Society, May 2.—Linnean, May 24, 1 P.M.—Asiatic, June 7, 1 P.M.

OBITUARY OF EMINENT PERSONS IN SCIENCE AND ART.

Joseph Mawe, Esq., celebrated throughout Europe as a mineralogist, geologist, and conchologist.—Sir Thomas Lawrence, P.R.A., F.R.S. &c., one of the most distinguished painters of his time.—Mr. F. A. Winsor, founder of the Gas Light and Coke Company in London, from whose public and persevering efforts arose likewise every other Gas Light establishment which has since been founded.—*Monthly Magazine*.—Mr. D. Adams, an eminent medico-electrician, and mathematical instrument maker to George III.—Baron Fourier, one of the Secretaries of the Academy of Sciences at Paris.—William Strutt, Esq., F.R.S., of Derby.—M. de Rossel, who accompanied d'Entrecasteaux in search of La Perouse, and founded the Paris Geographical Society.

SCIENTIFIC BOOKS PUBLISHED IN 1830.

Abernethy's Physiological Lectures and Discourses.—Abernethy's Lectures on Surgery.—Babbage on the Decline of Science.—Bell's Nervous System of the Human Body.—Bland's Philosophical Problems.—British Naturalist, 2 vol.—Clarke's Readings in Natural Philosophy.—Cuvier's Animal Kingdom, Aves, 3 vol.—Supplement to ditto, by Pidgeon.—Davy's (Sir H.) Consolation in Travel.—Delabeche's Views illustrative of Geological Phenomenon.—Delabeche's Geological Notes.—Encyclopaedia Metropolitana, 2nd division, Mixed Sciences, vol. 2.—Francœur's Hydrostatics translated.—Francœur's Course of Mathematics, vol. 2.—Gardens and Menagerie of the Zoological Society delineated, vol. I.—Hardcastle's Introduction to Botany.—Hogg's Chemical and Medical Tables.—Jennings' Treatise on Culture of Tobacco.—Johnson's (G. W.) History of English Gardening.—Lindley's Outline of the First Principles of Botany.—Lindley's Natural System of Botany.—Lindley's Orchideous Plants, part I.—Linnington's Compendium of Astronomy.—Loudon's Hortus Britannicus.—Lyell's Principles of Geology, vol. I.—Mackenzie's Manual of the Weather.—Moseley's Treatise on Hydrostatics and Hydrodynamics.—Murray's (John) Researches in Natural History.—Optics.—Library of Useful Knowledge.—Oxley's Celestial Planisphere.—Peacock's Treatise on Algebra.—Stokes' (Jon.) Botanical Commentaries, vol. I.—Strutt's Sylva Britannica.—Verning's Rudiments of Mineralogy.—Walker's Elements of Mechanics.—Worsdale's Genethliacal Astronomy.—Wright's First Three Sections of Newton's Principia, 2 vol.—Wright's Cambridge Mathematical Examination Papers, part I.

ASTRONOMICAL AND METEOROLOGICAL.

RURAL ECONOMY.

GARDENING.

DOMESTIC ECONOMY.

USEFUL AND ORNAMENTAL ARTS.

MISCELLANIES.

THE END.